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6. AUTHOR(S) Peter H. Smeallie, Editor Barry H. Brady, Chairman				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) National Research Council Commission on engineering and Technical Systems 2101 Constitution Ave Washington, DC 20418			8. PERFORMING ORGANIZATION REPORT NUMBER	
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13. ABSTRACT (Maximum 200 words) This program element supports National Research Council's Geotechnical Board activities to serve the national interests by investigating geotechnical issues of concern to government agencies and the public and making recommendations thereon; and to advance the development of geotechnical science and engineering through improvements in education, research, and practice and increased coupling among these elements; to enhance cooperation and transfer of technology among public and private organizations; and to enhance national and international cooperation and exchange of information among scientific, technical, and professional societies concerned with geotechnical issues. this report covers the Board's technical activities in the period of 93-94.				
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NATIONAL RESEARCH COUNCIL  
COMMISSION ON ENGINEERING AND TECHNICAL SYSTEMS  
2101 Constitution Avenue Washington, D.C. 20418

ENERGY ENGINEERING BOARD

(202) 334-3344

June 30, 1994

Ms. Wernita J. Slater  
Administrative Contracting Officer  
Air Force Office of Scientific Research  
Building 410  
Bolling AFB, D.C. 20332-6448

*Final Report*

Re: Grant No. F49620-93-0179

Dear Ms. Slater:

I am pleased to transmit the Activities Report of the National Research Council's Geotechnical Board for the period July 1, 1993 through June 30, 1994. Partial support of the work of the board is provided through Grant No. F49620-93-0179 between the U.S. Department of the Air Force and the National Academy of Sciences.

As you will note on the attached correspondence, the activities report was sent to Martin D. Lewis and Spencer Wu.

Sincerely,

*Mahadaven Mani*

Mahadaven (Dev) Mani  
Director

Enclosure

c: Charles Arbanas  
Archie L. Wood

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NATIONAL RESEARCH COUNCIL  
COMMISSION ON ENGINEERING AND TECHNICAL SYSTEMS  
GEOTECHNICAL BOARD  
U.S. NATIONAL COMMITTEE FOR ROCK MECHANICS

Mailing Address:  
2101 Constitution Avenue  
Washington, DC 20418  
FAX: (202) 334-3370

Office Location:  
Harris Building, Room 274  
2001 Wisconsin Avenue, N.W.  
(202) 334-3136

Barry H.G. Brady (1942) 1994, Chairman  
Manager, Applied Mechanics  
Dowell Schlumberger, Inc.  
Tulsa, OK  
(mining engineering)

Bernard Amadei (1954) 1994  
Professor, Dept. of Civil  
Engineering  
University of Colorado  
Boulder, CO  
(geological engineering)

Herbert Einstein (1937) 1994  
Professor, Dept. of Civil  
Engineering  
Massachusetts Institute of  
Technology  
Cambridge, MA  
(geotechnical engineering)

Bezalel C. Haimson (1936) 1995  
Professor, The College of  
Engineering  
University of Wisconsin-Madison  
Madison, WI  
(geological engineering)

Jane C.S. Long (1948) 1994  
Staff Scientist, Earth Sciences  
Division  
Lawrence Berkeley Laboratory  
Berkeley, CA  
(fractures and hydrology)

NAE James E. Monsees (1937) 1994  
PB Facilities Services  
Dallas, TX  
(tunnel construction)

NAE Ronald P. Nordgren (1936) 1994  
Herman and George R. Brown Professor  
of Civil Engineering  
Rice University  
Houston, TX  
(mechanical engineering applied  
to offshore technology, polar  
engineering, and petroleum  
production)

Miklos Salamon (1934) 1994  
Head, Dept. of Mining  
Engineering  
Colorado School of Mines  
Golden, CO  
(mineral and mining engineering)

Lawrence W. Teufel (1951) 1995  
Geomechanics Division  
Sandia National Laboratories  
Albuquerque, NM  
(geomechanics research)

NAS Donald L. Turcotte (1932) 1994  
Upson Professor of Engineering  
Dept. of Geological Sciences  
Cornell University  
Ithaca, NY  
(geophysics)

Lewis V. Wade (1945) 1994  
Research Director  
U.S. Bureau of Mines  
Minneapolis, MN  
(mineral and mining engineering)

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June 29, 1994

**MEMORANDUM**

**TO:        Sponsors of the Geotechnical Board**

William G. Austin, Bu. of Reclamation  
Don Banks, Army Corps of Engrs.  
Maxwell Blanchard, DOE  
Stephan Brocoum, DOE  
James Carney, DOE  
Robert E. Diebold, DOE  
Albert F. DiMillio, Fed. Hwy. Adm.  
J. Russell Dyer, DOE  
Allan J. Jelacic, DOE  
F. Michael Jenkins, Bu. of Mines  
Martin D. Lewis, AFOSR  
Don A. Linger, DNA  
Steve Markwell, Bu. of Reclamation  
Francis McLean, Bu. of Reclamation

Philip G. Meikle, Bu. of Mines  
John E. Mock, DOE  
Jeffrey G. Mora, Fed. Transit Adm.  
Robert B. Oswald, Army Corps of Engrs  
Thomas J. Pasko, Jr., Fed. Hwy. Adm.  
Jacob Philip, Nuclear Regulatory Com  
John Scalzi, NSF  
Lawrence L. Schulman, Fed Transit Adm  
Paul Senseny, DNA  
Mel Silberberg, Nuclear Regulatory Com  
William Simecka, DOE  
Dean Stucker, DOE  
Mehmet T. Tumay, NSF  
Spencer Wu, AFOSR

**FROM:     Dev Mani, Director, Geotechnical Board**

*Dev*

**SUBJECT: Activities Report, July 1, 1993 - June 30, 1994**

I am pleased to forward the subject activities report for the Geotechnical Board. I also want to inform you of recent organizational changes at the NRC's Commission on Engineering and Technical Systems, that has lead to the creation of two new boards to replace and expand on the charter of three existing boards, namely, the Energy Engineering, Geotechnical, and Building Research Boards. These changes have been made to broaden our capability to serve sponsors and to do so efficiently and effectively.

We are in a transitional phase and expect to have the new boards operational this summer. If you have any questions, please call me at (202) 334-3344. The fax number here is (202) 334-3370.

**Attachments:**

- (1) Organizational Changes
- (2) Geotechnical Board Activities Report



**NATIONAL RESEARCH COUNCIL  
COMMISSION ON ENGINEERING AND TECHNICAL SYSTEMS  
ORGANIZATIONAL CHANGES**

The Governing Board of the National Research Council (NRC) approved the formation of two new boards in its Commission on Engineering and Technical Systems (CETS), namely, the Board on Energy and Environmental Systems and the Board on Infrastructure and the Constructed Environment. The approval was given on May 18, 1994, following a consultative decision-making process in CETS.

The charters for the two new boards encompass and expand on the charters of the Energy Engineering, Geotechnical, and Building Research Boards they will replace. All of the issues that were of interest to the three older boards will remain within the purview of the new boards. The new boards are being configured to reflect strategic directions established by CETS to be more responsive to sponsor needs and to serve them more effectively. The new boards are expected to be in operation in summer 1994.

The Board on Energy and Environmental Systems (BEES) will advise the executive and legislative branches of government and the private sector on issues in energy and environmental technology, and related public policy. The board will also address related issues in national defense. The board will direct expert attention to energy supply, including resource extraction through mining and drilling, energy conversion, and efficiency of use. The board will also be concerned with environmental consequences of energy related activities and with pertinent environmental systems and control.

The BEES will oversee the activities of the U.S. National Committee for Rock Mechanics. The committee provides for U.S. participation in international activities in rock mechanics, principally through adherence to the International Society for Rock Mechanics. It also keeps the U.S. rock mechanics community informed about new programs directed toward major areas of national concern in which rock mechanics problems represent critical or limiting factors -- for example, energy resources, tunneling and other forms of excavation, underground storage and waste disposal, and reactor siting.

The Board on Infrastructure and the Constructed Environment (BICE) will advise the executive and legislative branches of government and the private sector on questions of technology, science and public policy applied to above ground and underground construction; public facilities; infrastructure systems and services; the relationship between the constructed and natural environments and their interaction with human activities; the effects of natural hazards on constructed facilities; and related issues of planning, design, construction, management, and use of the built environment.

The BICE will oversee the activities of the U.S. National Committee for Tunneling Technology (USNC/TT). The committee participates in activities of the International Tunneling Association. In addition, it keeps the U.S. tunneling community informed through the collection and dissemination of information related to tunneling technology, including standards, legal requirements, contracting practices, research and development and advances in the state-of-the-art. The BICE will also provide staffing and secretariat services for the Federal Facilities Council, a cooperative association of 18 federal government agencies concerned with building and infrastructure research, construction, facilities management, and evaluation.

**GEOTECHNICAL BOARD ACTIVITIES  
COMMISSION ON ENGINEERING AND TECHNICAL SYSTEMS  
NATIONAL RESEARCH COUNCIL**

**MEETINGS OF THE BOARD AND NATIONAL COMMITTEES**

**Geotechnical Board**

- July 23 - 25, 1993—Woods Hole, Massachusetts
- December 15 - 17, 1993—Washington, D.C.
- April 20, 1994, Washington, D.C., (Meeting & conference call)

**U.S. National Committee for Rock Mechanics**

- January 24 - 25, 1994—Irvine, California
- Informal meeting during the 1st North American Rock Mechanics Symposium, June 1-3, 1994, Austin, TX

**U.S. National Committee on Tunneling Technology**

- September 10 - 13, 1993—Washington, D.C.
- September 30, 1993—Washington, D.C.--Planning Meeting for the Safety Symposium to be held in Las Vegas, NV
- November 29 - December 1, 1993—Las Vegas, Nevada --"Symposium on Safety in the Underground Construction and Operation of the Exploratory Studies Facility at the Yucca Mountain Project"
- January 6 - 7, 1994—Irvine, California
- Informal Meeting during the North American Tunneling Conference & Exhibition '94, June 6-9, 1994, Denver, CO

**STATUS OF ON-GOING PROJECTS**

- (1) **Practical Lessons from the Loma Prieta Earthquake.** A symposium was organized under the auspices of the Geotechnical Board and the Board on Natural Disasters and held in spring 1993 in conjunction with the Earthquake Engineering Research Institute. The report on the symposium is in publication and will be issued shortly. This activity was sponsored by the U.S. Geological Survey.
- (2) **Drilling and Excavation Technologies for the Future.** This study examined opportunities for advances in drilling technologies that would have broad industrial, environmental and scientific applications. The report of the committee has been approved by the National Research Council for publication. The published version will be available later this summer. This activity was sponsored by the Geothermal Division of the Department of Energy's Office of Energy Efficiency and Renewable Energy and the Gas Research Institute.

- (3) **Symposium on Safety in the Underground Construction and Operation of the Exploratory Studies Facility.** This symposium was undertaken at the request of the DOE's Yucca Mountain Site Characterization Office and held last December at Las Vegas under the auspices of the U.S. National Committee on Tunneling Technology (USNC/TT). The proceedings are expected to be published later this year.
- (4) **Probabilistic Methods in Geotechnical Engineering.** This study addresses the potential and prospects for wider application of probabilistic methods in geotechnical engineering practice. A workshop was held in Irvine and provided substantial inputs to the deliberations of the study committee. The committee's report is currently in the peer review process. Sponsors of this activity include the Army Corps of Engineers, the Federal Highway Administration and the National Science Foundation.
- (5) **Rock Fracture and Fluid Flow: Contemporary Understanding and Applications.** The report of this study, initiated under the auspices of the board's U.S. National Committee for Rock Mechanics (USNC/RM), is also in the peer review process. This activity was sponsored by a number of agencies including the Bureau of Mines, the Bureau of Land Management, various offices of the Department of Energy--Environmental Management, Geothermal Division of the Office of Energy Efficiency and Renewable Energy, Fossil Energy, Superconducting Super Collider, Yucca Mountain Site Characterization--the Nuclear regulatory Commission, the Environmental Monitoring Systems and the Environmental Research Laboratories of the Environmental Protection Agency, and Dowell Schlumberger Inc.

## ATTACHMENTS

### **Geotechnical Board**

Roster of the Geotechnical Board, 1993-1994.

Meeting Agendas: July 23-25, 1993 & December 15-17, 1993.

### **U.S. National Committee for Rock Mechanics (USNC/RM)**

Roster of the USNC/RM, 1993-1994.

Meeting Agenda: January 24-25, 1994.

#### *Geotechnical News Article*

- March 1994, Report of the U.S. National Committee for Rock Mechanics, by Barry Brady, Chairman.

Recipients of the 1994 USNC/RM Awards.

### **U.S. National Committee on Tunneling Technology (USNC/TT)**

Roster of the USNC/TT, 1993-1994.

Meeting Agendas: September 10-13, 1993; September 30, 1993; November 29-December 1, 1993; January 6-7, 1994.

#### *Geotechnical News Article*

- March 1994, Report of the U.S. National Committee on Tunneling Technology, by Raymond L. Sterling, Chairman.

NATIONAL RESEARCH COUNCIL  
COMMISSION ON ENGINEERING AND TECHNICAL SYSTEMS  
GEOTECHNICAL BOARD

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NAE James K. Mitchell, Chairman (1930) 1994  
Cahill Professor of Civil Engineering, Emeritus  
University of California  
Berkeley, CA  
(Geotechnical Engineering, Ground  
Improvement, Waste Containment)

NAE Clarence R. Allen (1925) 1994  
NAS Professor of Geology and  
Geophysics Emeritus  
California Institute of Technology  
Pasadena, CA  
(Geophysics)

Joan Z. Bernstein (1926) 1994  
Vice President, Environmental  
Policy and Ethical Standards  
Waste Management, Inc.  
Oak Brook, IL  
(Environmental Protection, Waste  
Management)

David E. Daniel (1949) 1995  
L.B. (Preach) Meaders Professor of  
Civil Engineering  
University of Texas at Austin  
Austin, TX  
(Geoenvironmental Engineering/  
Risk & Reliability Assessment)

William S. Gardner (1930) 1994  
President, W.S. Gardner and  
Associates  
Blue Bell, PA  
(Foundations, Construction  
Management)

NAE James P. Gould (1922) 1994  
Partner  
Mueser Rutledge Consulting  
Engineers.  
New York, NY  
(Geotechnical Studies and Design  
for Foundations, Marine  
Structures, Tunnels, Marginal  
Sites)

Francois E. Heuze (1941) 1994  
Head, Geotechnical Group  
Lawrence Livermore National  
Laboratory  
Livermore, CA  
(Geomechanics, Rock Engineering,  
Energy Recovery)

NAE Charles C. Ladd (1932) 1994  
Professor of Civil Engineering  
Massachusetts Institute of  
Technology  
Cambridge, MA  
(Soil Structure Interaction)

James D. Murff (1941) 1995  
Research Advisor  
Exxon Production Research  
Company  
Houston, TX  
(Offshore Geotechnical  
Engineering, Earthquake  
Engineering)

NAE Shlomo P. Neuman (1938) 1995  
Regents' Professor, Department  
of Hydrology and Water  
Science  
The University of Arizona  
Tucson, AZ  
(Hydrogeology)

NAE Thomas D. O'Rourke (1948) 1995  
Professor, School of Civil and  
Environmental Engineering  
Cornell University  
Ithaca, NY  
(Underground Construction,  
Earthquake, Engineering and  
Natural Disasters,  
Infrastructure)

Reuben Samuels (1926) 1994  
Principal Engineering Consultant  
Parsons Brinckerhoff  
New York, NY  
(Geotechnical Engineering, Heavy  
Construction, Close Quarter  
Blasting, Urban Infrastructure)

Robert L. Schuster (1927) 1994  
Branch of Geologic Risk Assessment  
U.S. Geological Survey  
Denver, CO  
(Geological Engineering)

Don W. Steeples (1945) 1995  
Dean A. McGee Professor of  
Applied Geophysics  
The University of Kansas  
Lawrence, KS  
(Shallow Earth Geophysics)

National Research Council  
Commission on Engineering and Technical Systems

Geotechnical Board

National Academy of Sciences'  
J. Erik Jonsson Woods Hole Center  
314 Quissett Avenue  
Woods Hole, Massachusetts  
Room 208  
(508) 548-3760  
Fax (508) 540-4236  
July 23-25, 1993

**AGENDA**  
(as of July 19, 1993)

Friday, July 23, 1993

- 7:30 p.m. Assemble in Lobby of Falmouth Inn
- 7:45 Dinner at the Flying Bridge Restaurant, 220A Scranton Ave.  
Falmouth, MA 02540 (508) 548-2700

Saturday, July 24, 1993

- 7:30 a.m. Assemble in Lobby of Falmouth Inn
- 7:45 Buffet Breakfast at Study Center
- 8:30 Welcome/Review of Agenda *Attachment 1*  
— *Peter Smeallie*
- 8:40 Chairman's Statement  
— *Jim Mitchell*
- 8:50 Division of Energy, Infrastructure, and  
Environmental Engineering  
— *Jim Mitchell, Peter Smeallie*
- 9:05 Initiatives of the Commission on Engineering and Technical  
Systems (CETS)  
— *Marlene Beaudin, Associate Executive Director, CETS*  
— *Bob Katt, Associate Director, Quality Management, CETS*

- 9:20 CETS Quality Management  
— Bob Katt, Marlene Beaudin

Discussion

- 9:50 Bias Update  
— David Daniel, Bob Schuster  
— Discussion Led by Marlene Beaudin

National Academy of Sciences/National Research Council committees and boards consist of volunteers, such as yourselves, that are formed to achieve intellectual balance and capabilities. In order to assure this balance, each committee or board is required to discuss bias and composition, usually once a year. The Geotechnical Board held its annual discussion of bias at its April 1993 meeting. Today's bias update is for the three members not present at the April meeting and for any other members to describe changes that may have occurred since the last discussion. The bias discussion involves asking you to describe your current job responsibilities, consultancies you hold, sources of research support, organizational affiliations, relevant financial holdings, and public positions taken relevant to the board's charge (such as in published papers). A discussion of scientific misconduct will also be held. A confidential record will be made of the discussion.

- 10:10 Break

- 10:30 Current Activities of the Board on Earth Sciences and Resources (BESR) *Attachment 2*  
— Kevin Crowley, New Staff Officer, BESR

- 10:45 Discussion: Revisit Board's "Strategic Plan for 1994-1995" *Attachment 3*

- 11:15 Discussion: The Geotechnical Board—Role of the Board and its Members, Operations, Management Within the New CETS Structure

- 12:00 noon Lunch

- 1:00 Activities of and Principal Issues Facing the U.S. National Committee for Rock Mechanics *Attachment 4*  
— Barry Brady, Chairman, USNC/RM

- 1:15 Activities of and Principal Issues Facing the U.S. National Committee on Tunneling Technology *Attachment 5*  
— Ray Sterling, Chairman, USNC/TT



- 1:30 p.m. Discussion of USNC's: Current Activities and Plans, Roles, Operations, Management, Structure, Relationship to the Board  
— *François Heuzé (for USNC/RM), Tom O'Rourke and Rube Samuels (for USNC/TT)*
- 2:30 Discussion: Should the Board Change Its Name to Reflect Interest in Environmental Concerns -- For example, The Board on Geotechnical and Environmental Engineering *Attachment 6*
- 3:00 Break
- 3:15 Studies and Reports in Progress *Attachment 7*
- Fracture Characterization and Fluid Flow  
— *Peter Smeallie, Kevin Crowley*
- Practical Lessons from the Loma Prieta Earthquake  
— *Peter Smeallie, Clarence Allen*
- Probabilistic Methods in Geotechnical Engineering  
— *Peter Smeallie, Bob Schuster*
- New Infrastructure Technology: A Proposed Agenda for the NSF  
— *Peter Smeallie, Jim Gould*
- Advanced Drilling Technologies  
— *Peter Smeallie, Kevin Crowley*
- 4:15 Suggestions for Nominees for 1994 Geotechnical Board, USNC/TT, and USNC/RM
- 4:30 Other Business *Attachment 8*
- Reports from Liaison Activities
- ASFE  
— *Ron Smith*
  - ASCE  
— *Chuck Ladd*
  - Others as appropriate
- Conference on Mining and Resource Utilization in Space Exploration—The Board Has Been Asked to Propose Keynote Speaker
- CERF's National Program on High-Performance Geomedia Materials and Systems--Board Comments and Suggestions

1994 Meeting Dates

- 5:30 Adjourn
- 6:00 Reception/New England Clambake

Sunday, July 25, 1993

7:30 a.m. Assemble in Lobby of Falmouth Inn

7:45 Buffet Breakfast at Study Center

8:30 Potential Studies and Priorities

*Attachment 9*

U.S. National Committee on Tunneling Technology

- Microtunneling Technology
  - *Tom O'Rourke*
- Procurement of Tunneling: Encouraging Technological Innovation
  - *Ray Sterling*
- Symposium on Underground Construction Safety for the Exploratory Studies Facility at the Yucca Mountain Project
  - *Ray Sterling*

U.S National Committee for Rock Mechanics

- Geomechanics Research in Changing Social and Commercial Settings
  - *Barry Brady*
- Rock Anisotropy
  - *Barry Brady*
- Continuation of the INTRAVAL Program
  - *Barry Brady*

Geotechnical Board

- Third Geotechnology Workshop
  - *François Heuzé, Shlomo Neumann, Bob Schuster*
- Site Permeability Characterization for Environmental Assessment and Resource Recovery
  - *Shlomo Neuman, Chuck Ladd, David Daniel, François Heuzé*

- Geophysical Applications to Geotechnology
  - *Don Steeples, Donald Murff, Clarence Allen, Kevin Crowley*
- Follow-on to Lessons from the Loma Prieta Earthquake
  - *Clarence Allen, Tom O'Rourke, Jim Mitchell*
- Computerized Geotechnical Data Management
  - *Bob Schuster*

Special Study

- Applying Anti-Terrorism Technology to Protect U.S. National Assets
  - *Peter Smeallie, François Heuzé*

12:00 noon    Adjourn with Lunch

12/14/93

National Research Council  
Commission on Engineering and Technical Systems

**GEOTECHNICAL BOARD**

National Academy of Sciences  
2101 Constitution Avenue, N.W.  
Board Room  
Washington, DC 20418

December 15-17, 1993

**AGENDA**

**MEETING OBJECTIVES**

- To review and reaffirm or revise the *raison d'être*, roles responsibilities and procedures of the Geotechnical Board within the context of the CETS and the NRC.
- To review current and future activities and continuity of the Board.

Wednesday, December 15, 1993 - *Executive Dining Room*, National Academy of Sciences Building, 2101 Constitution Ave., N.W.

6:30 - 7:30 p.m.	Reception
7:30 - 9:00 p.m.	Dinner
9:00 p.m.	Adjourn

Thursday, December 16, 1993 - *Board Room*, National Academy of Sciences Building

8:15 - 9:45 a.m.      **EXECUTIVE SESSION**

Strategy, Operations, Procedures and Practices

- *J. Mitchell, D. Mani, T. O'Rourke, R. Whitman,  
B. Brady, R. Sterling*

- Expectations of the NRC and the CETS
- Report on the CETS Meeting, October 3-5, 1993
- Study process, report process
- Roles and responsibilities of Board members
- Roles and responsibilities of the National Committees
- Roles and responsibilities of NRC staff
- Resources

AGENDA  
Page Two

9:45 - 10:00 a.m. Break

10:00 - 12:00 noon OPEN SESSION

National Environmental Issues and Opportunities for the  
Geotechnical Board

Board Discussion with Invited Guests:

- *Raymond C. Loehr, Univ. of Texas, Austin*
- *Jack Fowle, Staff Member, U.S. Congress*

12:00 - 1:45 p.m. Lunch with Invited Guests and Board Sponsors  
*Members Room*

2:00 - 2:15 p.m. Sponsor Presentation: Modeling of Engineered Covers for  
Performance Assessments of Low Level Radioactive Waste (LLW)  
Disposal Facilities; *Board Room*

Performance assessment of LLW, disposal facilities is an essential part of the process for licensing. The modeling of flow through the engineered covers (including concrete vault) of the LLW disposal facility is one important aspect of performance assessment. A modeling approach that takes into account infiltration, properties of engineering materials and flow through the system is presented.

*Jacob Philip, Ralph Cady, Tom Nicholson, U.S. Nuclear Regulatory Commission*

2:15 - 2:30 p.m. Q & A

2:30 - 2:45 p.m. Sponsor Presentation: Geomechanical, Geotechnical & Geo-  
Environmental Systems Program at NSF; *Board Room*

This program emphasizes fundamental and innovative research to improve the state of the art of analytical, computational, and experimental geo-systems. The program encourages the transfer of knowledge, data and information from the research stage to use by designers and industry. Research aimed at increasing the basic understanding of the behavior of geomaterials in ambient, subterranean, offshore, hazardous and extra-terrestrial environments is encouraged.

*Mehmet Tumay, National Science Foundation*

2:45 - 3:00 p.m. Q & A

3:00 - 3:30 p.m. Break

## EXECUTIVE SESSION

### Strategy, Operations, Procedures and Practices (Continued)

- 3:30 - 5:00 p.m.      Status Report and Discussion of Current Activities
- Loma Prieta (*P. Smeallie, C. Guarnizo, C. Allen*)
  - Fracture and Fluid Flow (*P. Smeallie, B. Brady*)
  - Advanced Drilling (*P. Smeallie, K. Crowley*)
  - Probabilistic Methods (*P. Smeallie, R. Schuster*)
  - Safety Symposium at Yucca Mountain (*R. Sterling*)
  - Characterizing the Upper Crust (*D. Steeples, J. Price, T. Usselman*)
- 5:00 - 6:00 p.m.      Prospective Activities and Board Actions
- Site Permeability (*S. Neuman, et al.*)
  - Seismic Mapping (*T. O'Rourke, et al.*)
  - Microtunneling and Trenchless Technologies (*R. Sterling*)
  - Safety in Underground Construction (*R. Sterling, R. Schuster*)
  - Rock Anisotropy (*B. Brady*)
  - Design of Experiments for Model Validation (*B. Brady, S. Neuman*)
  - Other
- 6:00 - 6:30 p.m.      Board Discussion
- Roles and Responsibilities
  - Board Name
  - Appointments to the Board
- 6:30 p.m.              Adjourn

Friday, December 17, 1993 - Board Room, National Academy of Sciences Building

## OPEN SESSION

- 8:30 - 9:00 a.m.      Presentation on The Workshop of Geomedia Materials and Systems
- Harvey Bernstein, Richard Belle, Civil Engineering Research Foundation*

**AGENDA**  
**Page Four**

**EXECUTIVE SESSION**

9:00 - 11:00 a.m.	Board Discussion (Continued) Conclusions
11:00 - 12:00 noon	Action Items Agenda for Next Board Meeting
12:00	Lunch and Adjourn

National Research Council  
Commission on Engineering and Technical Systems

**U.S. National Committee for Rock Mechanics**

Arnold and Mabel Beckman Center  
National Academy of Sciences and Engineering  
Board Room  
100 Academy Drive  
Irvine, California  
January 24-25, 1994

**AGENDA**

**MEETING OBJECTIVES**

- To review and reaffirm or revise the *raison d'etre*, roles, responsibilities and procedures of the USNC/RM within the context of the Geotechnical Board, CETS, and NRC.
- To review current and future activities and continuity of the National Committee.

January 24, 1994, Monday

7:30 - 8:30 a.m.                      Breakfast, *Beckman Center Refectory*

8:30 - 10:30 a.m.                    **EXECUTIVE SESSION, Board Room**

Chairman's Report, *Barry Brady*

Update on Organizational Changes: Strategy, Operations,  
Procedures and Practices

*Dev Mani, Barry Brady*

- Expectations of the NRC and the CETS
  - Roles and Responsibilities of Geotechnical Board
  - Roles and Responsibilities of the USNC/RM members
- Report on the Geotechnical Board Meeting,  
December 16-17, 1993
- Resources for the USNC/RM

10:30 - 10:45 a.m.                    Break

10:45 - 12:00 noon                   **OPEN SESSION**

Charter of the USNC/RM  
(Purpose and Functions)



AGENDA  
Page Two

- 12:00 - 1:00 p.m.                      Lunch, *Beckman Center Refectory*
- 1:00 - 1:45 p.m.                      Appointment of New Members  
*Barry Brady et al*
- Composition and Balance on the USNC/RM
  - Candidates for Membership
- 1:45 - 2:30 p.m.                      Status of On-going Studies  
*Jane Long, Peter Smeallie*
- Rock Fractures and Fluid Flow: Contemporary Understanding and Applications
  - Advanced Drilling and Rock Comminution Technologies
- 2:30 - 2:45 p.m.                      Break
- 2:45 - 5:00 p.m.                      Prospective Activities and Committee Actions
- Rock Anisotropy (New Study)  
*Bernard Amadei*
  - Validation of Conceptual Models  
*Barry Brady*
  - Use of the SCC Exploratory Shaft and Tunnel as RM Test Facilities  
*Bezalel Haimson, Barry Brady*
  - Potential Policy-Oriented Studies  
*Barry Brady et al*
- 5:00 p.m.                                  Adjourn
- 6:00 p.m.                                  Dinner

January 25, 1994, Tuesday

- 7:30 - 8:30 a.m.                      Breakfast, *Beckman Center Refectory*
- 8:30 - 11:00 a.m.                      OPEN SESSION, *Board Room*
- Discussion and Actions

AGENDA  
Page Three

- The NARM Symposium, June 1-3, 1994, Austin, TX  
*Priscilla Nelson*
- The 35th Rock Mechanics Symposium (1995)  
*Barry Brady*
- Awards: Process and Status  
*Barry Brady*
- ISRM  
*Herbert Einstein, Barry Brady*
  - International Symposium, May 10-14, 1994,  
Santiago, Chile
  - 8th ISRM Congress, September 25-30, 1995,  
Tokyo, Japan
  - 1995 Muller and Rocha Awards Nominations

11:00 - 12:00 noon

Wrap-up

12:00 noon

Lunch and Adjourn

National Research Council  
Geotechnical Board  
Article for Geotechnical News, March 1994  
Peter H. Smeallie, Editor

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**Report of the U.S. National Committee for Rock Mechanics**  
by  
**Barry H. Brady, Chairman**

This is the report on activities of the U.S. National Committee for Rock Mechanics (USNC/RM) in 1993. The purpose is to provide an account of major items of business in which we were engaged during the year and to foreshadow activities for 1994.

The main items of business of the USNC/RM are the conduct of special studies on topics of interest to government sponsors of the committee, recurrent sponsorship of the annual U.S. Rock Mechanics Symposium, and awards recognizing distinguished contributions to the discipline of rock mechanics. The committee also seeks to make a contribution, appropriate to the leading position of the U.S., in the affairs of the International Society for Rock Mechanics. For each of these activities, the past year has been as productive as others in the recent past. We have made firm plans for the next planning cycle, spanning about two years.

#### SPECIAL STUDIES OF THE USNC/RM

A special study is conducted on approximately an annual basis by a panel of specialists appointed under the procedures of the U.S. National Research Council, the operating arm of the National Academy of Sciences. The purpose is to provide an account of the status of a topic of contemporary interest to the U.S. rock mechanics community and its supporting agencies. In mid-1993, a report entitled "Borehole Stability" was issued. The study panel, chaired by Dr. Jean-Claude Roegiers, considered fundamental and engineering aspects of borehole stability with reference to wellbore stability, mine excavations and civil tunnels. Copies of the report were provided to individuals in the international rock mechanics community; response to the report was satisfactory.

A study, which is being performed by a committee chaired by Dr. Jane Long and which will conclude in 1994, is considering the topic "Rock Fractures and Fluid Flow: Contemporary Understanding and Applications." A notable aspect of the study has been the interest it has generated in government agencies and industrial corporations. The final draft of the report has been circulated for critical review according to the procedures of the National Research Council. The final report will appear in a book to be published by the U.S. National Academy Press.

At least one new study will start in 1994. "Rock Anisotropy," proposed by Dr. Bernard Amadei of the University of Colorado, would follow the established style of studies conducted in the past.

## U.S. ROCK MECHANICS SYMPOSIA

The annual U.S. Rock Mechanics Symposium is a platform for presentation of work of topical interest, of both U.S. and international origin. Its main function is to provide the opportunity for effective and prompt peer review of current work in U.S. universities, national laboratories and private corporations. It attracts international attention as a snapshot of the status of U.S. rock mechanics and, increasingly, as a presentation venue for international researchers seeking prompt review and recognition of their work. A prime concern of the USNC/RM is to assure a high technical quality for the symposium proceedings. In that setting, the 34th Symposium was conducted at the University of Wisconsin, Madison, in late June 1993, with a local organizing committee led by Professor Bezalel Haimson. The meeting was a great success in all respects. With about 190 technical presentations, some lively discussion and more than 400 registrants, of whom about one-third came from outside the U.S., the meeting continued the record of broad scope, first-class presentations and informed discussion for which the series is noted. In a departure from usual practice, selected papers from the technical presentations will appear later as a special issue of the International Journal for Rock Mechanics.

With 1994 reserved for the NARM Symposium described below, Professor Jaak Daemen of the University of Nevada, Mackay School of Mines, has started planning for the 35th Symposium in 1995.

## NORTH AMERICAN ROCK MECHANICS SYMPOSIUM (NARMS)

The first NARMS will be conducted at the University of Texas at Austin in 1994. This symposium represents a joint effort between the national groups of Canada, the U.S. and Mexico. In the call for papers, the chair and co-chair of the local organizing committee, Professor Priscilla Nelson and Dr. Stephen Laubach, sought abstracts for papers concerned with the industries applying rock mechanics, specifically the mining, civil construction and petroleum industries. For some sessions, some changes in format from the traditional style are proposed with a view to injecting more vitality into technical transactions. The program will include workshops and short courses on topics of industrial interest, symposium activities which have been well received in recent years. Among the pre- and post-conference tours, visits will be arranged to excavations originally planned to house the Superconducting Super Collider at Waxahachie. With the endorsement of the North American Free Trade Agreement, the proposed discussion of "The Engineering Profession and NAFTA" will extend the technical scope of the meeting.

The response to the call for papers was enthusiastic, both from within the U.S. and the other NARMS host countries and from other ISRM countries. More than 260 abstracts were received, of which about 140 were accepted as being suitable for preparation of papers. Members of the USNC/RM participated in the review of abstracts and will further participate in the review of the papers as they are received. The Local Organizing Committee has been particularly concerned to conform with the technical standards prescribed by the national committee.

## PARTICIPATION IN THE ACTIVITIES OF THE ISRM

The International Society for Rock Mechanics recognizes the USNC/RM as the national group for registration of ISRM members in this country. In that function, the committee's intention is to provide effective representation of the U.S. in the international geomechanics community through active participation in the business of the international society. In the past, the main engagement of the U.S. rock mechanics community in the affairs of the international body has been through conduct of the annual U.S. rock mechanics symposium.

For the following reasons, it is essential that the USNC/RM derive full benefit for our sponsoring agencies from the formal activities of the ISRM and represent U.S. interests adequately in other ways in the international sphere. The ISRM is involved in setting and endorsing standards for rock mechanics and rock engineering practice. It organizes meetings of specialists which issue documents of record on major contemporary issues in geomechanics, such as hydrocarbon resource recovery, hazardous waste isolation and rock construction practices. Through its annual meeting and other symposia, it provides technical exchange and international peer review of projects addressing topics of interest to both the major industrialized countries and the developing countries. There are obvious economic as well as technical implications of these activities. The USNC/RM maintains a continuous involvement in the ISRM to ensure that international standards properly reflect U.S. practices, that our supporting agencies are aware of international developments in critical areas and that U.S. standards, research and engineering and government policies are well presented in the international rock mechanics community.

In 1993, the U.S. participated in the business of the ISRM in several ways. Professor Charles Fairhurst, a former chairman of the USNC/RM, is currently President of the ISRM. The USNC/RM has provided support for Professor Fairhurst in various forms in the discharge of his duties. Several members of the committee are active on the working groups of the ISRM that set recommended standards for rock engineering. We attended the meeting of the ISRM Council in June. Finally, we were responsible for the formation and funding (through private subscription) of a Membership Development Fund. This will be used at the discretion of the ISRM President to promote membership of the ISRM in the newly liberated countries of Eastern Europe.

## RESEARCH AND ENGINEERING AWARDS FOR 1993

The USNC/RM recognizes outstanding contributions to the basic science and engineering applications of rock mechanics by appropriate awards. The award panel consists of seven distinguished academics chaired by a member of the Committee, for 1993 the chairman being Professor Miklos Salamon of Colorado School of Mines. The 1993 awards in the various categories follow.

Basic Research: P.P. Nelson and S.D. Glaser

Applied Research: C. Lee and R. Sterling

Case Histories: L.W. Teufel, D.W. Rhett, and H.E. Farrell

M.S. Thesis: M.A. Vieira (University of Oklahoma)

Ph.D. Thesis: K.T. Nihei (University of California at Berkeley)

**U.S. National Committee for Rock Mechanics  
1994 Awards**

**Presented at the First North American Rock Mechanics Symposium  
The University of Texas at Austin, Austin, Texas  
June 1-3, 1994**

**Basic Research**

**Emmanuel Detournay and Alexander Cheng, "Plane Strain Analysis of a Stationary Hydraulic Fracture in a Poroelastic Medium," Int. J. Solids Structures, 1991.**

**Applied Research**

**Moo Y. Lee and Bezalel C. Haimson, "Laboratory Study of Borehole Breakouts in Lac du Bonnet Granite: A Case of Extensile Failure Mechanism," Int. J. Rock Mech. Min. Sci., 1993.**

**Case History**

**J. David Rogers, "Reassessment of the St. Francis Dam Failure," Special Publication No.4, Ass. Eng. Geologists.**

NATIONAL RESEARCH COUNCIL  
COMMISSION ON ENGINEERING AND TECHNICAL SYSTEMS  
GEOTECHNICAL BOARD  
U.S. NATIONAL COMMITTEE ON TUNNELING TECHNOLOGY

Mailing Address:  
2101 Constitution Avenue  
Washington, DC 20418  
FAX: (202) 334-3370

Office Location:  
Harris Building, Room 274  
2001 Wisconsin Avenue, N.W.  
(202) 334-3136

Raymond L. Sterling, Chairman (1949) 1993  
Director, Underground Space Center  
University of Minnesota  
Minneapolis, MN  
(Underground Space Planning)

Richard W. Balcerzak (1937) 1995  
Assistant General Manager  
Metropolitan Water District of  
Southern California  
Los Angeles, CA  
(Underground Construction)

NAE Lloyd A. Duscha (1925) 1994  
Consulting Engineer  
Reston, VA  
(Construction Management)

NAE George A. Fox (1920) 1995  
President and Chief Engineer  
Grow Tunneling Corporation  
New York, NY  
(Underground Construction/  
Excavation)

Richard F. Harig (1931) 1993  
Sr. Vice President and Technical Director  
Parsons Brinckerhoff Quade and  
Douglas  
Denver, CO  
(Tunnel Design)

NAS John W. Hutchinson (1939) 1994  
NAE Gordon McKay Professor of Applied  
Mechanics  
Harvard University  
Cambridge, MA  
(Applied Mechanics)

Martin N. Kelley (1928) 1993  
President (retired)  
Kiewit Engineering Company  
Omaha, NE  
(Underground Construction)

NAE Albert A. Mathews (1915) 1994  
President  
Al Mathews Corporation  
Federal Way, WA  
(Tunnel Design)

Priscilla P. Nelson (1949) 1995  
Associate Professor, Department  
of Civil Engineering  
University of Texas at Austin  
Austin, TX  
(Underground Construction  
Equipment)

Harvey W. Parker, III (1936) 1993  
Senior Vice President  
Shannon & Wilson, Inc.  
Seattle, WA  
(U.S. Representative to the  
International Tunnelling  
Association)

**U.S. NATIONAL COMMITTEE ON TUNNELING TECHNOLOGY**  
**Hosting**  
**THE EXECUTIVE COUNCIL OF**  
**INTERNATIONAL TUNNELLING ASSOCIATION**

September 10-13, 1993  
Washington, D.C.

***Preliminary Agenda***  
(As of September 2, 1993)

Washington, DC Hotel:  
JW Marriott Hotel  
Pennsylvania Avenue at  
National Place  
1331 Pennsylvania Avenue, NW  
Washington, DC 20004  
202-393-2000  
800-228-9290  
Fax 202-626-6943

ITA Executive Council Host:  
Mr. Peter H. Smeallie  
Director, U.S. National Committee on  
Tunneling Technology  
National Academy of Sciences  
2101 Constitution Avenue, N.W.  
Washington, D.C. 20418  
202-334-3136  
Fax 202-334-3370

Friday, September 10th

9:00am

**Tour of JW Marriott Hotel Facilities for 1996 ITA General Assembly.**

*Assemble in Hotel Lobby to meet Jim Landis (Marriott Staff) and Susan Nelson (AUA).*

10:00am-  
4:00pm

**The American Underground Space Association's Coach Tour of Washington, D.C. Tour Guide: Susan Kilpatrick.**

*Stops at the U.S. Capitol, Jefferson Memorial, Lincoln Memorial, Arlington Cemetery, and Vietnam Veterans Wall. Lunch Stop at Union Station. Ride Past the Library of Congress, Supreme Court, Pennsylvania Avenue, Washington Monument, White House.*

6:00pm-  
7:30pm

**TUNNELS! Reception**

Smithsonian Institution Libraries/U.S. National Committee on Tunneling Technology, National Academy of Sciences' Reception for the Opening of the Smithsonian Institution Libraries Exhibition on "Tunnels!" By Invitation.

*National Museum of American History, First Floor, West Wing, 14th and Constitution Avenues, NW.*



AGENDA  
Page Two

- 7:30pm                      Transportation from the reception to the National Academy of Sciences' building and back to the Marriott Hotel after dinner. Will be provided by the Washington Car and Driver.
- 8:00pm                      **ITA Executive Council Dinner.** Hosted by U.S. National Committee on Tunneling Technology. By Invitation.
- Members Room, National Academy of Sciences, 2101 Constitution Avenue, NW, Washington, DC.*

Saturday, September 11th

- 9:00am-  
Noon                              **Working Session of the ITA Executive Council.**
- Salon 1 Grand Ballroom or Commerce Room in Marriott Hotel*
- Noon-  
1:30pm                              **Lunch**
- 1:30pm-  
4:30pm                              **Tour of Metro Tunnel Projects.** Host: Walt Mergelsberg, Director, Office of Construction, Washington Metropolitan Area Transit Authority.
- Assemble in Marriott Lobby. Walk to Metro Center Subway Station. Subway ride to meet at Fort Totten Station. Tour train control, power and communications, rooms. Walk NATM station area. Board train; enter NATM tunnel section. Continue thru two-pass constructed tunnel. Tour completed Prince Georges Station. Board train to Greenbelt Station. Return to Fort Totten. Tour operations control center in Jackson Graham Building (Judiciary Square Metro Station).*
- 7:00pm                              **Reception and Dinner.** At Occidental Grill, 1475 Pennsylvania Avenue.
- Sponsored by The Robbins Company.*

Sunday, September 12th

- 8:00am-  
11:45am                              **Working Session of the ITA Executive Council.**
- Salon 1 Grand Ballroom or Commerce Room in Marriott Hotel*

**AGENDA**  
**Page three**

**12:00noon**                    **Assemble in Lobby (with luggage) for transportation to the Air and Space Museum.**

**12:15pm-  
1:15pm**                    **Lunch**

*Wright Place Restaurant, National Air and Space Museum, 7th and Independence Avenues, SW, Washington, DC.*

**1:30pm-  
2:45pm**                    **Special Guided Tour of the Smithsonian Air and Space Museum.**

**2:45pm**                    **Transportation from the Museum to Union Station.**

**3:30pm-  
6:29pm**                    **Amtrak Metroliner #214. Washington's Union Station to New York City's Penn Station.**

*Upon arrival in New York City, it is advisable to take yellow taxi cabs from Penn Station to the U.N. Plaza-Park Hyatt on 44th St. @ 1st Avenue.*

**Evening Free**

**New York City Hotel:  
U.N. Plaza-Park Hyatt  
One United Nations Plaza  
44th Street @ 1st Avenue  
New York, NY 10017  
212-758-1234  
800-228-9000  
Fax 212-702-5051**

**Monday, September 13th**

**9:00am**                    **Meet in Hotel Lobby**

**9:15am-  
10:15am**                    **Special Guided Tour of the United Nations for ITA Executive Council and Guests.**

*Sponsored by Shannon and Wilson, Inc.*

**AGENDA**  
**Page Four**

**10:30am**

**UN/ITA Joint Meeting**

*ITA Executive Council and Personnel from the United Nations'  
Department of Technical Cooperation for Development, Infrastructure  
Branch.*

**Welcome and Introductions**

**10:40am-  
10:50am**

**Current Status of United Nations**

*By: Ousmane Gueye*

**10:50am-  
11:00am**

**Brief Statements**

*By: Ms. Ayoub  
Mr. Piola*

**11:00am-  
11:10am**

**Description and Goals of the ITA Organization**

*By: Dan Eisenstein  
Claude Berenguier*

**11:10am-  
11:30am**

**Observations on the Importance of Tunnelling to Developing Countries.**

*By: Abdel Salam*

**11:30am-  
11:40am**

**UN/ITA Cooperation on the Gibraltar Tunnel**

*By: Manuel Serrano  
Dan Eisenstein*

**11:40am-  
11:45am**

**Cooperation and Activities Between the UN and ITA**

- Tunnelling staff for UN in Saudi Arabia
- Workshop in Morocco and Brazil

*By: Harvey Parker*

**AGENDA**  
**Page Five**

**11:45am-  
12:20pm**

**Open Discussion on What ITA Can Do to Help the United Nations Meet its Goals.**

**12:20pm-  
12:25pm**

**Summary and Proposal of Future Coordination with the UN.**

*By: Dan Eisenstein*

**12:25pm-  
12:30pm**

**Closure**

*By: Ousmane Gueye*

**12:30PM**

**Lunch**

**Afternoon**

**Return to Washington or fly from New York.**

U.S. National Committee on Tunneling Technology

Committee Meeting to Plan the  
Symposium on Safety in the  
Underground Construction and Operation of the  
Exploratory Studies Facility at the Yucca Mountain Project

National Academy of Sciences  
Room NAS 280  
2101 Constitution Avenue, N.W.  
Washington, D.C.

September 30, 1993

AGENDA

10:00 a.m. Review of Project Description

Review of Progress to Date (Materials in Folder)

Symposium Agenda and Speakers

- Session 1 (YMP)
- Keynote Address (USNC/TT)
- Session 2 (USNC/TT)
- Informal Discussion (USNC/TT)
- Session 3 (USNC/TT)
- Session 4 (YMP)
- Session 5 (USNC/TT)

12:00 noon Discussion of Bias

*National Academy of Sciences/National Research Council committees consist of volunteers, such as yourselves, that are formed to achieve intellectual balance and capabilities. In order to assure this balance, each committee is required to discuss bias and composition, usually once a year. During this discussion you will be asked to describe your current job responsibilities, consultancies you hold, sources of research support, organizational affiliations, relevant financial holdings, and public positions taken relevant to the committee's charge (such as in published papers). A discussion of scientific misconduct will also be held. A confidential record will be made of the discussion.*

12:30 p.m. Lunch

1:15 Call to Linda Evans, YMP—Symposium Logistics

Symposium Planning Meeting Agenda  
September 30, 1993  
Page two

- 1:30 p.m.     Role of USNC/TT Members / Respondents, Introducers?
- Symposium Proceedings
- Materials/Papers from Speakers
  - Edited Transcripts
  - Production, Review, Schedule
- 2:45             Call to Ken Elder, YMP—Program Issues of Concern
- Symposium Invitations / Audience
- 3:30             Adjourn

National Research Council  
Geotechnical Board  
U.S. National Committee on Tunneling Technology

**SYMPOSIUM ON SAFETY IN THE UNDERGROUND CONSTRUCTION AND OPERATION OF  
THE EXPLORATORY STUDIES FACILITY AT THE YUCCA MOUNTAIN PROJECT**

Alexis Park Hotel  
Zeus Room  
375 East Harmon  
Las Vegas, Nevada  
Phone (702) 796-3300 / Fax (702) 796-4334

November 29 - December 1, 1993

*The Yucca Mountain Project's Exploratory Studies Facility will involve up to 14 miles of tunneling, geologic characterization activities, and scientific experiments extending over a period of 6 to 8 years. The major tunneling work will be done using a tunnel boring machine, but drill and blast and other excavation methods will be used for some areas of excavation. Some scientific and excavation work will have to be carried out concurrently in the facility. Construction safety and facility operation safety must both be considered. This symposium is organized by the National Research Council's U.S. National Committee on Tunneling Technology. The presentations are meant to educate symposium participants about tunneling construction safety practices in other projects in the United States and around the world. The presentations are the responsibility of the invited speakers and do not represent the position of the National Research Council.*

**AGENDA**

**Sunday, November 28**

8:00 p.m.      Get-Acquainted Dinner for Speakers, USNC/TT, Guests  
                  *Pegasus Gourmet Room, Alexis Park Hotel*

**Monday, November 29 - Tour of Yucca Mountain Site**

7:15 a.m.      Bus from Alexis Park Hotel to the Yucca Mountain Information Office (YMIO),  
                  4101 Meadows Lane, Las Vegas

7:30            Tour YMIO / Badging Process  
                  *Note: If Born Outside the U.S., Bring Passport*

8:30            Travel to Yucca Mountain Site

10:30          Tour of Yucca Mountain Site

4:30 p.m.      Travel Back to Hotel

**Tuesday, November 30**

8:00 a.m.      Registration

8:45            Welcome and Introduction to the Symposium  
                 • *Ray Sterling, Chairman, U.S. National Committee on Tunneling Technology*

**SESSION 1 - INTRODUCTION TO THE YUCCA MOUNTAIN PROJECT (YMP)**

8:55 a.m.            • *William B. Simecka, Director, Engineering and Development Division, USDOE*

10:00            • *Dennis R. Williams, Chief, Site Investigation Branch, USDOE*

10:20            Questions

10:30            Break

11:00            **Keynote Address: Underground Construction Safety: "Be Sure You're on the Right Track"**  
                 • *Joseph Fitzgerald, Deputy Assistant Secretary for Safety and Quality Assurance, USDOE*

11:45            Lunch

1:00 p.m.        **SESSION 2 - INVITED PRESENTATIONS ON ISSUES IN UNDERGROUND SAFETY MANAGEMENT**

Introduction

                 • *Priscilla Nelson, Member, U.S. National Committee on Tunneling Technology*

1:10            Considerations in the Development of the DOE's Construction Safety Program  
                 • *Patrick Finn, Safety Engineer, Office of Occupational Safety, USDOE*

1:45            OSHA Regulations and Their Implications in the Construction of the ESF at Yucca Mountain  
                 • *Fred A. Anderson, P.E., Consulting Engineer*

2:30            Break

3:00            Underground Regulatory Safety Today  
                 • *Byron Ishkanian, Principal Safety Engineer and Corporate Safety Director, Cordoba Corp.*

3:40            Safety Engineering Design Analyses  
                 • *Bruce Blackford, P.E., Research Analysis Corporation*

4:20            Milwaukee Water Pollution and Abatement Program: Underground Safety--Dealing with OSHA  
                 • *John Ramage, Vice President, CH2M Hill*

5:00            Adjourn/ Informal Discussion  
                 *No-Host Reception - Zeus Foyer*



**Wednesday, December 1**

**8:00 a.m. SESSION 3 - EXPERIENCE IN THE U.S. AND ABROAD**

**Introduction**

- *Priscilla Nelson*

**8:10 Waste Isolation Pilot Plant (WIPP): The Underground Safety Culture**

- *Fred Ashford, Mining Operations Manager, Westinghouse*
- *Linda Calderon, Manager of Industrial Safety*

**9:00 Defence Nuclear Agency**

- *Joseph W. LaComb, Chief, Nevada Operations Office, DNA*

**9:50 Break**

**10:20 Underground Safety of the Äspö Hard Rock Laboratory (Sweden)**

- *Olle Zellman, Swedish Nuclear Fuel and Waste Management Co.*

**11:10 Safety Management in PNC's Shaft Excavation Effects Project in Japan**

- *Kozo Sugihara, Senior Research Engineer, PNC Chubu Works*

**12:00 The Channel Tunnel**

- *Timothy J. Green, U.K. Operations Project Office, Transmanche-Link*

**12:50 p.m. Lunch**

**2:00 SESSION 4 - DISCUSSION SESSION**

**Keynote Address: OSHA and Construction Safety**

- *Patrick Tyson, Consulting, Brooks and Smith*

**2:30 Open Discussion**

**2:50 Break**

**3:05 SESSION 5 - SAFETY PROGRAMS AT THE YMP**

**Safety Review/Coordination**

- *Russell B. Baumeister, Occupational Safety and Health Specialist, USDOE*

**Systems Safety**

- *H. Kenneth Elder, General Engineer, Engineering and Development Division, USDOE*

**Management and Operations Contractor**

- *Carl Pierce, Manager of Safety and Health, TRW Environmental Safety Systems, Inc.*

**Construction Safety (Reynolds Engineering and Electrical Co.)**

● **Panel:**

*H. Steve Jones, Manager, Occupational Safety and Fire Protection*

*Randy H. Leske, Safety Professional*

*Ronald Costin, Medical Director*

*Harrison F. Kerschner, Manager, Health Protection Department*

**Tunnel Constructor**

- *Lance de Stwolinski, Project Manager, Kiewit/PB*

**5:00**

**Closing Remarks**

- *Ray Sterling*

**5:15**

**Adjourn**

**6:15 - 8:15**

**U.S. National Committee on Tunneling Technology Meeting**

**8:30 p.m.**

**Committee Dinner  
Jerome's Restaurant**

National Research Council  
Commission on Engineering and Technical Systems  
Geotechnical Board

**U.S. NATIONAL COMMITTEE ON TUNNELING TECHNOLOGY**

The Arnold and Mabel Beckman Center  
of the  
National Academies of Sciences and Engineering  
Board Room  
100 Academy Drive  
Irvine, California  
January 6-7, 1994

**AGENDA**

**MEETING OBJECTIVES**

- To review and reaffirm or revise the *raison d'être*, roles, responsibilities and procedures of the USNC/TT within the context of the Geotechnical Board, CETS, and NRC.
- To review current and future activities and continuity of the National Committee.

January 6, 1994, Thursday

7:30 - 8:30 a.m.                      Breakfast, *Beckman Center Refectory*

8:30 - 10:00 a.m.                      **EXECUTIVE SESSION, Board Room**

Update on Organizational Changes: Strategy, Operations,  
Procedures and Practices

*Dev Mani, Ray Sterling*

- Expectations of the NRC and the CETS
  - Roles and responsibilities of Geotechnical Board
  - Roles and responsibilities of the USNC/TT members
- Report on the Geotechnical Board Meeting,  
December 16-17, 1993
- Resources for the USNC/TT

10:00 - 10:15 a.m.                      Break

10:15 - 11:15 a.m.                      **OPEN SESSION**

Charter of the USNC/TT

AGENDA  
Page Two

- |                         |  |
|-------------------------|--|
| 11:15 - 12:00 noon      | Appointment of New Members <ul style="list-style-type: none"><li>• Composition and Balance on the USNC/TT</li><li>• Candidates for Membership</li></ul>  |
| 12:00 - 1:00 p.m.       | Lunch  |
| 1:00 - 3:00 p.m.        | Yucca Mountain Project: Symposium on Safety in the Underground Construction and Operation of the Exploration Studies Facility<br><br><i>Ray Sterling, Priscilla Nelson, Peter Smeallie</i> <ul style="list-style-type: none"><li>• Report on the Symposium at Yucca Mountain, December 1-2, 1993</li><li>• Assignments and schedule to complete projects</li><li>• Follow-up actions with DOE, OSHA and other agencies</li></ul> |
| 3:00 - 3:15 p.m.        | Break  |
| 3:15 - 5:00 p.m.        | Prospective Studies and Committee Actions <ul style="list-style-type: none"><li>• Safety in Underground Construction<br/><i>Ray Sterling</i></li><li>• Microtunneling and Trenchless Technologies<br/><i>Ray Sterling</i></li><li>• Global Competitiveness in Underground Construction<br/><i>Lloyd Duscha</i></li></ul>   |
| 5:00 p.m.               | Adjourn  |
| 6:00 p.m.               | Dinner   |
| January 7, 1994, Friday |  |
| 7:30 - 8:30 p.m.        | Breakfast, <i>Beckman Center</i>   |
| 8:30 -10:30 a.m.        | OPEN SESSION, <i>Board Room</i><br><br>Discussion and Action   |

AGENDA  
Page Three

- International Tunnelling Association (ITA)
  - Executive Council Meeting, Washington, D.C., September 10-13, 1993
  - USNC/TT at the ITA Meeting, Cairo, Egypt, April 3-6, 1994
  - US Representation on ITA Working Groups
  - United Nations Initiatives
  - Plans for 1996 ITA Annual Meeting
- North American Tunneling (NAT), Denver, Colorado, June 6-9, 1994
- Sponsored Lecture at the 1994 NAT
- Other Activities

10:30 - 10:45 a.m.

Break

10:45 - 12:00 noon

Discussion and Action (Continued)  
Wrap-Up

12:00 noon

Lunch and Adjourn

**National Research Council  
Geotechnical Board  
Article for Geotechnical News, March 1994  
Peter H. Smeallie, Editor**

\*\*\*\*\*

**January 1994 Report of the U.S. National Committee on Tunneling Technology  
by  
Raymond L. Sterling, Chairman**

This is my last letter as chairman of the U.S. National Committee on Tunneling Technology (USNC/TT) and I will be ending a long, enjoyable, and rewarding stay on the committee. Also retiring from the committee will be Richard Harig and Martin Kelley. The new nominations for committee members and chair have been made and should be able to be confirmed in the next few months.

The major committee activity of the last several months was the convening of a construction safety symposium requested by the Yucca Mountain Project Office with regard to the Exploratory Studies Facility. The symposium was held November 30-December 1, 1993, in Las Vegas and was preceded by a visit to the Yucca Mountain site where the starter tunnel and an initial experimental alcove have been completed. Keynote speakers for the symposium were Joe Fitzgerald, Deputy Assistant Secretary for Safety and Quality Assurance at the Department of Energy, and Patrick Tyson, an attorney with Brooks and Smith, formerly the head of the U.S. Occupational Safety and Health Administration. Other invited speakers for the symposium reflected a wide range of experience with underground construction safety programs and safety regulations. Experience was included from radioactive waste isolation test facilities in Japan and Sweden, major tunnel projects in the United States and abroad, such as the Milwaukee Water Pollution and Abatement Program and the Channel Tunnel together with experience from relevant research/excavation programs in the United States—the Defense Nuclear Agency and the Waste Isolation Pilot Plant project.

The program had a somewhat different emphasis from the previous (1992) safety symposium organized by the USNC/TT for the Superconducting Super Collider project, but the program was again very stimulating for the participants. Despite the inherent safety difficulties, underground construction safety records continue to improve—responding to the emphasis on management responsibility in ensuring full participation in attaining safety goals. The sobering aspects of the issue are the questions of how safety regulation interpretations are made (or not made) and the manner in which the enforcement process can be applied.

Proceedings from the Yucca Mountain Safety symposium will contain the written versions of the presentations given; the report is scheduled for release in July 1994.

The committee came away from the symposium with the feeling that there were several issues in the underground construction safety arena which need a close examination as to how the overall system for underground construction safety is organized and regulated.

The committee will be pursuing the possibility of a separate study on this topic. If you would like a copy of the report or have views on the safety issue, please let the committee know by contacting the U.S. National Committee on Tunneling Technology, National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington, D.C. 20418.

In other topical areas of discussion for the committee, we continue to pursue the establishment of a study committee for policy issues related to microtunneling and trenchless technologies for use in infrastructure and environmental monitoring and remediation. The committee met to discuss these and other issues on January 6-7, 1994, and will meet again at the North American Tunneling (NAT) conference in Denver on June 6-8, 1994. At the NAT '94 meeting, the USNC/TT plans to invite conference participants to share/update their views on an ongoing issue for the committee—how the United States might do better in encouraging the movement of research and innovation into practice without compromising the positive aspects of the U.S. procurement and design/construction practices. Again, we hope you will share your views. We are pleased to announce that Thomas O'Rourke will deliver the USNC/TT Sponsored Lecture at NAT '94.

The International Tunnelling Association (ITA) will meet in Cairo from April 3-7, 1994, and we hope that there will be again the strong U.S. participation in ITA activities that has occurred in the last 2-3 years.

The ITA Executive Committee held one of its 1993 meetings in Washington, D.C. and New York from September 10-13. The Washington, D.C. location allowed a review of the facilities for the U.S. hosting of the 1996 Annual Meeting of the ITA. The New York visit permitted the ITA Executive Committee to meet directly with United Nations staff to discuss increasing its activities as a United Nations non-governmental organization.

The National Research Council has been reshuffling its board organization under the Commission on Engineering and Technical Systems (CETS) and a new organization chart for CETS is attached. Peter Smeallie, who has been the committee's staff director for the past several years, is now concentrating on report activities for the Geotechnical Board, the U.S. National Committee for Rock Mechanics, and our committee. Dev Mani now has the staff director responsibility for our committee along with the Rock Mechanics committee, the Geotechnical Board, the Building Research Board, and the Energy Engineering Board. We are hoping that additional staff support will quickly follow. Please welcome Dev to his new responsibility and thank Peter for his continued outstanding efforts on behalf of the committee.

A final word in closing is that the Committee on Infrastructure in which the USNC/TT and the Geotechnical Board participated, has released its report, "In Our Own Backyard." Please contact the National Academy Press (202-334-3313) for copies. A further report on "Research Needs for Infrastructure," chaired by James Gould, Partner, Mueser Rutledge Consulting Engineers, is due for release later this year.

9-10349

NATIONAL RESEARCH COUNCIL  
COMMISSION ON ENGINEERING AND TECHNICAL SYSTEMS  
GEOTECHNICAL BOARD

Mailing Address:  
2101 Constitution Avenue  
Washington, DC 20418  
FAX: (202) 334-3370

Office Location:  
Harris Building, Room 274  
2001 Wisconsin Avenue, N.W.  
(202) 334-3136

July 23, 1993

**MEMORANDUM**

To: Sponsors of Geotechnical Board

William G. Austin, Bureau of Reclamation  
Don Banks, Army Corps of Engineers  
Maxwell Blanchard, Department of Energy  
Stephan Brocoum, Department of Energy  
James Carney, Department of Energy  
Robert E. Diebold, Department of Energy  
Albert F. DiMillio, Federal Highway Administration  
F. Michael Jenkins, Bureau of Mines  
✓ Martin D. Lewis, Air Force Office of Scientific Research  
Don A. Linger, Defense Nuclear Agency  
Steve Markwell, Bureau of Reclamation  
Francis McLean, Bureau of Reclamation  
Philip G. Meikle, Bureau of Mines  
Jeffrey G. Mora, Federal Transit Administration  
Robert B. Oswald, Army Corps of Engineers  
Thomas J. Pasko, Jr., Federal Highway Administration  
Jacob Philip, Nuclear Regulatory Commission  
John Scalzi, National Science Foundation  
Lawrence L. Schulman, Federal Transit Administration  
Paul Senseny, Defense Nuclear Agency  
Mel Silberberg, Nuclear Regulatory Commission  
William Simecka, Department of Energy  
Dean Stucker, Department of Energy  
Mehmet T. Tumay, National Science Foundation  
Spencer Wu, Air Force Office of Scientific Research

From: Peter H. Smeallie 

Subject: Annual Activities Report

I am pleased to submit to you the Geotechnical Board's Annual Activities Report for the period July 1, 1992 through June 30, 1993.



Geotechnical Board  
National Research Council

**Activities Report**  
**July 1, 1992 - June 30, 1993**

The Geotechnical Board, a part of the U.S. National Research Council, which is the operating arm of the National Academy of Sciences and the National Academy of Engineering, serves to advise the federal government and others on issues where geotechnology can have an impact, such as environmental remediation and infrastructure development. The board met three times during the reporting period to review current projects and to initiate activities that move the knowledge base of geotechnology forward. The board operates with two long-standing national committees, the U.S. National Committee for Rock Mechanics and the U.S. National Committee on Tunneling Technology. It also conducts special studies at the request of the government.

A list of attachments follows:

- (A) Description and membership of the Geotechnical Board
- (B) Agendas from the July 1992, December 1992, and April 1993 Geotechnical Board meetings
- (C) Sponsors of the Geotechnical Board
- (D) Description and membership of the Committee on Reliability Methods for Risk Mitigation in Geotechnical Engineering
- (E) Description and membership of the Committee on Fracture Characterization and Fluid Flow
- (F) Description and membership of the Committee on Practical Lessons of the Loma Prieta Earthquake
- (G) Description and membership of the Committee on Advanced Drilling Technologies
- (H) Description and membership of the Committee for An Infrastructure Technology Research Agenda
- (I) Description and membership of the U.S. National Committee on Tunneling Technology
- (J) Agendas from the July 1992, October 1992, and June 1993 USNC/TT meetings
- (K) Activities of the International Tunnelling Association
- (L) Report on the "Underground Construction Safety" Symposium
- (M) Description and membership of the U.S. National Committee for Rock Mechanics
- (N) Agendas from the January 1993 and June 1993 USNC/RM meetings
- (O) **Stability, Failure, and Measurements of Boreholes and Other Circular Openings**
- (P) 34th U.S. Rock Mechanics Symposium
- (Q) 1993 Rock Mechanics Awards Recipients
- (R) Letters from the USNC/RM and USNC/TT chairmen summarizing their activities

## Geotechnical Board

The Geotechnical Board conducts its program to fulfill the following basic purposes: to serve the national interests by investigating geotechnical issues of concern to government agencies and the public; to advance the development of geotechnical science and engineering through improvements in education, research and practice; to enhance cooperation and transfer of technology among public and private organizations; and to enhance national and international cooperation and exchange of information among scientific, technical, and professional societies concerned with geotechnical issues. Geotechnology describes both the science and engineering of soil deposits, rock masses, and the fluids they contain—referred to as earth materials. It has many facets and draws upon a variety of disciplines that work with earth materials. The application of geotechnology can improve the environment, mitigate natural hazards, and construct engineered facilities to improve the quality of life. The 1993 Geotechnical Board comprises the following individuals:

James K. Mitchell, CHAIRMAN  
University of California, Berkeley

Charles C. Ladd  
Massachusetts Institute of Technology

Clarence Allen  
California Institute of Technology

James D. Murff  
Exxon Production Research

Joan Z. Bernstein  
Waste Management, Inc.

Shlomo P. Neuman  
University of Arizona, Tucson

David E. Daniel  
University of Texas at Austin

Thomas D. O'Rourke  
Cornell University

William S. Gardner  
W. S. Gardner & Associates

Reuben Samuels  
Parsons Brinckerhoff

James P. Gould  
Mueser-Rutledge Consulting Engineers

Robert L. Schuster  
U.S. Geological Survey

François E. Heuzé  
Lawrence Livermore National Laboratory

Don W. Steeples  
University of Kansas

GEOTECHNICAL BOARD  
COMMISSION ON ENGINEERING AND TECHNICAL SYSTEMS  
NATIONAL RESEARCH COUNCIL

Attachment B

**GEOTECHNICAL BOARD MEETING**

National Academy of Sciences'  
J. Erik Jonsson Woods Hole Center  
314 Quissett Avenue  
Woods Hole, Massachusetts  
Room 208  
(508) 548-3760  
Fax (508) 540-4236  
July 24-26, 1992

**Agenda**

Friday, July 24, 1992

8:00 p.m. Dinner at Falmouth Square Inn

Saturday, July 25, 1992

7:30 a.m. Assemble in Lobby of Falmouth Square Inn

7:45 Buffet Breakfast

8:30 Welcome/Review of Agenda

Attachment A

Update of Members' Professional and Other Activities of Interest

9:15 Presentation on Institute for Professional Practice (IPP)  
— *Joseph Ward, President, IPP*

Attachment B

9:45 Activities of and Principal Issues Facing the U.S. National  
Committee for Rock Mechanics  
— *Barry Brady, Chairman, USNC/RM*

Attachment C

10:15 Activities of the U.S. National Committee on Tunneling  
Technology  
— *Peter Smeallie*

Attachment D

10:45 Geotechnical Research Employing the Centrifuge Technique  
● *Discussion of Charlie Babendreier's Proposal*

Attachment E

11:00 Reports from Liaison Activities  
● ASFE, *Ron Smith*  
● ASCE, *Charles Ladd*  
● Others as appropriate

## Geotechnical Board Agenda

Page two

- 11:15 Introduction to "Ongoing, Pending, and Planned Activities of the Geotechnical Board" Attachment F  
— *Peter Smeallie*
- Discussion of General Program Goals and Direction
- 12:00 noon Lunch
- 1:00 p.m. Discussion continues, as warranted
- 1:30 Reports on Ongoing Studies
- Fracture Characterization and Fluid Flow Attachment G  
— *Barry Brady*
  - Reliability Methods for Risk Mitigation in Geotechnical Engineering Attachment H  
— *Bob Schuster*
  - Symposium on Underground Construction Safety Attachment I  
Management for the Superconducting Super Collider  
— *Peter Smeallie*
  - Physical Infrastructure Technology Research Needs for the Attachment J  
21st Century  
— *Jim Gould, Tom O'Rourke*
- 3:00 Reports on Pending Projects
- Loma Prieta: Implications for Practice Attachment K  
— *Peter Smeallie, Clarence Allen*
  - Advanced Drilling and Rock Comminution Technologies Attachment L  
— *Jim Mitchell, Peter Smeallie*
  - Research Opportunities in Rock Mechanics (USNC/RM) Attachment M  
— *Barry Brady*
  - Procurement Practices for Underground Construction Attachment N  
(USNC/TT)  
— *Peter Smeallie*
- 4:30 Overall Discussion of Planned Projects and Priorities
- 5:30 Adjourn
- 6:00 Reception/New England Clambake

### Sunday, July 26, 1992

- 7:30 a.m. Assemble in Lobby of Falmouth Square Inn
- 7:45 Buffet Breakfast

## Geotechnical Board Agenda

Page three

- |            |  |              |
|------------|--|--------------|
| 8:30       | Continued Discussion of Planned Projects and Priorities  | Attachment O |
|            | ● Effectiveness of Landfill Liner Systems  |              |
|            | — <i>Jim Mitchell</i>  |              |
|            | ● Use of the Observational Method for Cleanup of Waste Containment Sites   | Attachment P |
|            | — <i>Jim Mitchell</i>  |              |
|            | ● Future Directions for Geophysical Engineering in Geotechnology   | Attachment Q |
|            | — <i>Jean-Claude Roegiers</i>  |              |
|            | ● Technology Transfer Between the DOE Labs and the Bureau of Mines   | Attachment R |
|            | — <i>Francois Heuze</i>  |              |
|            | ● Underground Excavation: Technical Assistance for the Yucca Mountain Proposed High-Level Nuclear Waste Repository | Attachment S |
|            | — <i>Tom O'Rourke</i>  |              |
|            | ● Research Needs in Geo-environmental Science and Engineering  | Attachment T |
|            | — <i>Peter Smeallie</i>  |              |
| 11:00      | Next Meeting   |              |
| 12:00 noon | Adjourn. Lunch will be available.  |              |

GEOTECHNICAL BOARD  
COMMISSION ON ENGINEERING AND TECHNICAL SYSTEMS  
NATIONAL RESEARCH COUNCIL

**GEOTECHNICAL BOARD MEETING**

National Academy of Sciences'  
Cecil and Ida Green Building  
2001 Wisconsin Avenue, N.W.  
Washington, D.C.

December 14-16, 1992

**Agenda**

**Monday, December 14th**  
Room GR 116

- 6:30 p.m. Evening Business Session of the Geotechnical Board
- Welcome, Announcements
    - *James Mitchell, Chairman*
    - *Peter Smeallie, Director*
  - CETS Strategic Plan and the Geotechnical Board Section 1
    - *Arch Wood, Executive Director, CETS*
    - *Robert Katt, Associate Director for Quality Management*
    - *William Webster, CETS Liaison to the Geotechnical Board*
- 7:30 The Second Federal Geotechnology Workshop: Update, Section 2  
Discussion, Introduction Assignments  
— *François Heuze, Workshop Chairman*
- 8:15 Dinner at Taberna Del Alabadero, 1776 Eye Street, N.W.,  
(202) 429-2200

**Tuesday, December 15th**  
Room GR 130

- 8:00 a.m. Welcome/Introductory Remarks
- *Peter Smeallie, Director, Geotechnical Board*
  - *James K. Mitchell, Chairman, Geotechnical Board*
  - *François Heuze, Member, Geotechnical Board, and Workshop Chairman*
- 8:30 Los Alamos National Laboratory (*Tom Dey, Caroline Reynolds, Ed Van Eeckhout*)
- Introduction
  - Reservoir Phenomena
    - Reservoir performance prediction
      - porous flow modeling; multi-component; multiphase
      - wave propagation; dynamic compaction of porous media

- Engineering
  - caps and barriers for containing subsurface containments
  - geothermal energy
- Sensing
  - Remote sensing: satellite, airborne, surface
  - Fiber optics
  - Seismic methods: geothermal and petroleum applications

10:00 a.m. Break

10:20 Lawrence Berkeley Laboratory (*Jane Long, Don DePaulo*)

- Laboratory and Field Technology
  - Geothermal and petroleum reservoirs: high resolution imaging
  - Remediation of near-surface materials: transport, containment
  - Fracture characterization for high-level nuclear waste disposal
- Interpolation and Prediction Technology
  - Geothermal: well test analyses, heat and mass transfer
  - Petroleum reservoirs: fractured and porous systems, multi-phase, multi-component flow
  - Nuclear wastes: coupled heat-flow-chemical modeling
  - Remediation: capture zones, injection/extraction systems, capillary barriers

11:50 Lunch

1:30 p.m. Lawrence Livermore National Laboratory (*François Heuze, Jesse Yow, Jay Zucca*)

- Environmental
  - Dynamic underground stripping
  - In-situ microbial filters
  - Containment: flow and transport
  - Sensors and sensor emplacement
  - Underground imaging
- Geotechnical/Geomechanics/Geophysics
  - Coupled stress-fractures-flow reservoir stimulation models
  - Dynamics of particulate and blocky media
  - High-temperature and pressure rock testing
  - Dynamics of rock reinforcement systems
  - Dry-hole and large-hole logging
  - Integrated computational earthquake studies

3:00 Break

**Federal Geotechnology Workshop**  
**December 15, 1992**  
**Page 3**

3:30 p.m. Sandia National Laboratories (*Wolfgang Wawersik, Joe Tillerson, Norm Warpinski*)

- Measurements and Instrumentation
  - Scope of SNLA experience
  - Issues of measurement quality
  - New techniques
  - Applications: geotechnical, energy, environment, remediation, infrastructure, transportation
- Fossil Energy Research
  - Mine-back of hydrofractures
  - Multi-Well experiment
    - ▶ geology
    - ▶ in-situ stresses
    - ▶ hydrofracturing
    - ▶ rock mechanics
  - Ekofisk: soft-rock formation mechanics
- Geotechnical Capabilities
  - Systems approach
  - Rock testing, computer simulations
  - Applications: penetrators, cross-well seismics, geoscience research, geothermal, seafloor earthquake measurements

5:00 Adjourn

5:15 Reception / Hors d'Oeuvres

7:00 Adjourn

**Wednesday, December 16th**  
**Room GR 120**

8:30 a.m. Regular Business Meeting of the Geotechnical Board  
Continental Breakfast Available in Room

Welcome/Review and Agenda  
— *James Mitchell*

8:40 Discussion of Second Federal Geotechnology Workshop  
— *François Heuze*  
— *Robert Schuster* (Comment on Future Workshop)

8:50 Board Membership in 1993  
— *James Mitchell*  
— *Peter Smeallie*

Section 3



**Federal Geotechnology Workshop**  
**December 15, 1992**  
**Page 4**

- 9:00 a.m. Reports from Liaison Activities
- ASFE, *Lynne Cramer*
  - ASCE, *Charles Ladd*
  - Others as Appropriate
- 9:15 Activities of and Principal Issues Facing the U.S. National Committee on Tunneling Technology Section 4  
— *Raymond Sterling, Chairman, USNC/TT*
- 9:45 Activities of the U.S. National Committee for Rock Mechanics Section 5  
— *Barry Brady, Chairman, USNC/RM*
- 10:00 Break
- 10:15 Reports on Ongoing Studies Section 6
- Fracture Characterization and Fluid Flow  
— *Jane Long, Chairman of the Study Committee*
  - Reliability Methods for Risk Mitigation in Geotechnical Engineering  
— *Wilson Tang, Chairman of the Study Committee*  
— *Robert Schuster, Member of the Study Committee*  
— *William Gardner, Member of the Study Committee*
  - Physical Infrastructure Technology Research Needs for the 21st Century  
— *James Gould, Chairman of the Study Committee*  
— *Thomas O'Rourke, Member of the Study Committee*  
(Comments on Japan)
  - Symposium on Practical Lessons from the Loma Prieta Earthquake  
— *Clarence Allen, Member of the Study Committee*
- 11:15 General Discussion of Current Program
- Discussion of Prospective Studies and the Geotechnical Board's Strategic Plan Section 7
- Studies identified by the Board, undertaken by a separate committee, and supported by core support, e.g., Future Directions for Geophysical Engineering in Geotechnology
  - Studies identified by the Board for outside agency support, e.g., the Effectiveness of Landfill Liner Systems
  - Studies identified and undertaken by the USNCs, e.g., Research Opportunities for Rock Mechanics
  - Studies requested by agencies, e.g., Yucca Mountain Project Initiatives
- 12:00 noon Discussion continues through lunch

**Federal Geotechnology Workshop**  
**December 15, 1992**  
**Page 5**

- 12:45 p.m.    Joint Meeting with the Board on Earth Sciences and Resources    Section 8  
Room GR 104
- The Board on Earth Sciences and Resources
    - *William Fisher, Chairman of the Board*
  - The Geotechnical Board
    - *James Mitchell, Chairman of the Board*
  - Study of Advanced Drilling Technologies
    - *Neville Cook, Proposed Chairman of the Study Committee*
  - DOE's Interest in Advanced Drilling Technologies
    - *John (Ted) Mock, Director, Geotechnical Division, DOE*
- 1:30            Continuation of Prospective Studies and the Strategic Plan    Section 7
- Need for Geotechnical Board Reports
  - Priorities
  - New Study Ideas (International program)
- 2:45            1993 Meetings:
- April 1-2, 1993 at the Beckman Center?
  - July 24-25, 1993 at the Woods Hole Study Center?
  - December 13-15, 1993 at the National Academy of Sciences, Washington, D.C.?
- Other Venues  
Other Meeting Formats
- 3:00            Adjourn

National Research Council  
Commission on Engineering and Technical Systems

Geotechnical Board

National Academy of Sciences  
Arnold and Mabel Beckman Center  
Board Room  
100 Academy Drive  
Irvine, California  
April 1-2, 1993

AGENDA

Thursday, April 1st

- 8:00 a.m. Assemble in lobby of Four Seasons Hotel for transportation to the Beckman Center.
- 8:15 Breakfast at Beckman Center
- 9:00 Welcome, Introductions of New Members
- Chairman's Statement  
— *James Mitchell*
- Director's Statement—State of the Board  
— *Peter Smeallie*
- Discussion
- 10:00 *Bicoastal video link to Robert Whitman, CETS liaison representative to the board. Move to Room IId.*
- Perceptions of Geotechnical Board within CETS and NRC/Institutional Focus  
— *William Webster, Robert Whitman*
- Proposed Division of Energy, Infrastructure, and Environmental Engineering  
— *Robert Whitman, James Mitchell*
- Role of the U.S. National Committees  
— *Peter Smeallie, Thomas O'Rourke*
- Discussion on Each of the Above

Geotechnical Board Agenda  
April 1-2, 1993  
Page two

11:00 a.m. *Bicoastal video link ends. Move back to Board Room.*

Continuation of Discussion in Light of Board's Strategic Plan  
— *Peter Smeallie, James Mitchell*

12:00 noon Lunch

1:00 p.m. Annual Discussion of Bias  
— *Peter Smeallie*

National Academy of Sciences/National Research Council committees consist of volunteers, such as yourselves, that are formed to achieve intellectual balance and capabilities. In order to assure this balance, each committee is required to discuss bias and composition, usually once a year. During this discussion you will be asked to describe your current job responsibilities, consultancies you hold, sources of research support, organizational affiliations, relevant financial holdings, and public positions taken relevant to the committee's charge (such as in published papers). A discussion of scientific misconduct will also be held. A confidential record will be made of the discussion.

2:00 1993 Federal Geotechnology Workshop  
— *François Heuzé*

2:30 **Fresh Ideas.** Revisit seven national issues within the context of CETS Strategic Plan and NRC mission.

Each "team" of board members should prepare a ten minute presentation assessing the role of geotechnology under each national issue and identify areas of work where the board could be of service to the government.

Environmental Protection/Waste Management  
— *James Mitchell, Shlomo Neuman, Don Steeples*

Infrastructure Development and Rehabilitation  
— *James Gould, Don Steeples*

Construction Efficiency and Innovation  
— *William Gardner, Reuben Samuels*

**Fresh Ideas, continued**

National Security

— *François Heuzé*

Resource Discovery and Recovery

— *Charles Ladd, Don Murff*

Mitigation of Natural Hazards

— *Clarence Allen, François Heuzé*

Frontier Exploration and Development

— *Thomas O'Rourke, William Webster, Jim Mitchell*

4:30 p.m.      Proposals for New Initiatives

5:30            Adjourn

6:30            Dinner

**Friday, April 2nd**

7:30 a.m.      Assemble in lobby of Four Seasons Hotel for transportation  
to the Beckman Center

7:45            Breakfast at Beckman Center

8:30            National Geotechnical Experimentation Sites (NGES)  
— *Richard Woods*

9:00            **Ongoing studies, activities, and reports in progress —**  
Discussion of status and solicitation of board advice

U.S. National Committee on Tunneling Technology  
— *Thomas O'Rourke*

U.S. National Committee for Rock Mechanics  
— *Peter Smeallie*

**Ongoing studies, activities, and reports in progress,  
continued**

**Committee on Practical Lessons from the Loma Prieta  
Earthquake**

— *Clarence Allen*

**Committee on Advanced Drilling Technologies**

— *Peter Smeallie*

**Committee on Fracture Characterization and Fluid Flow**

— *Peter Smeallie*

**Committee on Reliability Methods for Risk Mitigation in  
Geotechnical Engineering**

— *Peter Smeallie*

**10:30 a.m. Pending Activities**

**Draft Proposal for the Geotechnical Borehole Sealing  
Workshop (FHWA)**

*Geotechnical News* Articles

**Geophysical Techniques for Geotechnical Engineering**

**Effectiveness of Landfill Liner Systems**

**Computerized Geotechnical Data Management (from Robert Schuster)**

**11:45 Summary, Action Items, Next Meetings**

**12:00 noon Adjourn with lunch**

## **SPONSORS OF THE GEOTECHNICAL BOARD**

Dr. Spencer Wu  
Program Manager  
Directorate of Aerospace Sciences  
Air Force Office of Scientific Research  
Bolling AFB  
Washington, D.C. 20332

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Washington, D.C. 20332

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Research and Development Directorate  
HDQA (DAEN-RDZ-A)  
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Washington, D.C. 20314

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Mechanics Division  
Army Corps of Engineers  
Waterways Experiment Station  
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Technology  
U.S. Bureau of Mines  
810 7th Street, N.W.  
Washington, D.C. 20241

**Bureau of Mines**

Mr. Philip G. Meikle  
Chief, Division of Health, Safety  
and Mining Technology  
U.S. Bureau of Mines  
MS 6203  
2401 E Street, N.W. #653  
Washington, D.C. 20241

**Defense Nuclear Agency**

Department of Energy, Energy Research

Mr. James Carney  
Principal Engineer  
OSSC WSO, ER-93  
U.S. Department of Energy  
Washington, D.C. 20545



Dr. Stephan Brocoum, RW-22  
 Director, Analysis and Verification  
 Division, Room 7F051  
 Office of Civilian Radioactive  
 Waste Management  
 U.S. Department of Energy  
 1000 Independence Avenue, S.W.  
 Washington, D.C. 20585

**Department of Energy, Civilian RadWaste**

Mr. Dean Stucker, RW-22  
 General Engineer  
 Office of Civilian Radioactive  
 Waste Management  
 U.S. Department of Energy  
 1000 Independence Avenue, S.W.  
 Washington, D.C. 20585

Mr. Albert F. DiMillio, P.E.  
 Highway Research Engineer  
 Construction, Maintenance and  
 Environmental Design Division  
 Federal Highway Administration HNR-30  
 6300 Georgetown Pike  
 McLean, VA 22101

**Federal Highway Administration**

Mr. Thomas J. Pasko, Jr., P.E.  
 Director, Office of Engineering and  
 Highway Operations Research and Development  
 Federal Highway Administration  
 Turner-Fairbank Highway Research Center  
 6300 Georgetown Pike  
 McLean, VA 22101

Mr. Lawrence L. Schulman  
 Associate Administrator for Technical  
 Assistance and Safety  
 Federal Transit Administration  
 U.S. Department of Transportation  
 400 7th Street, S.W.  
 Washington, D.C. 20590

**Federal Transit Administration**

Mr. Jeffrey G. Mora  
 Transportation Systems Manager  
 Office of Engineering Applications  
 Federal Transit Administration  
 U.S. Department of Transportation  
 400 7th Street, S.W.  
 Washington, D.C. 20590

Mr. Mel Silberberg  
Branch Chief  
Waste Management Branch  
Division of Engineering  
Office of Nuclear Regulatory Research  
Nuclear Regulatory Commission  
Washington, D.C. 20555

**Nuclear Regulatory Commission**

Mr. Jacob Philip  
Office of Nuclear Regulatory Research  
Nuclear Regulatory Commission  
Washington, D.C. 20555

Dr. Mehmet T. Tumay  
Director, Geomechanics Program  
Directorate for Engineering  
National Science Foundation  
1800 G Street, N.W. -- Room 1110  
Washington, D.C. 20550

**National Science Foundation**

Dr. John Scalzi  
Program Director, Structures and  
Building Systems  
Directorate for Engineering  
National Science Foundation  
1800 G Street, N.W. -- Room 1108  
Washington, D.C. 20550

## **Committee on Reliability Methods for Risk Mitigation in Geotechnical Engineering**

**The Committee on Reliability Methods for Risk Mitigation in Geotechnical Engineering** is preparing a report on reliability methods for risk mitigation in geotechnical engineering. The report will summarize the results of a workshop held in July 1992 that examined the role of probabilistic methods in characterizing geotechnical uncertainties. The workshop consisted of invited "probabilists" (those who advocate the use of reliability methodology) and "traditionalists" who presented papers that addressed the reasons for the limited use of reliability methods in geotechnical engineering, and discussed the possibilities for deriving greater benefit from reliability methodology. The committee's report will propose ways to enhance greater communication and cooperation between probabilists and traditionalists addressing the needs of both practitioners and researchers. The report is scheduled for publication in the fall 1993. The committee comprises the following individuals:

Wilson H. Tang, CHAIRMAN  
University of Illinois at  
Urbana-Champaign

Emilio Rosenblueth  
National Autonomous University of  
Mexico

J. Michael Duncan, VICE-CHAIRMAN  
Virginia Polytechnic Institute and  
State University

Robert L. Schuster  
U.S. Geological Survey

C. Allin Cornell  
Stanford University

Tien H. Wu  
Ohio State University

William S. Gardner  
Woodward Clyde Consultants

**Committee on Fracture Characterization and Fluid Flow**

**The Committee on Fracture Characterization and Fluid Flow** consists of 13 experts in rock mechanics, hydrogeology, hydrofractures, geophysics, geology, statistics, and seismology. The committee has met six times over the last two years and is in the process of finishing its report, scheduled for publication in December 1993. The committee will attempt to identify the tools and methods associated with identifying fractures, describe the essential fundamentals behind the use and interpretation of the tools and methods, assess these methods and provide illustrative examples of their use. In addition, the committee will identify areas of cross fertilization between various disciplines and between applications. The committee will address three common issues that have been articulated by the sponsoring agencies and others that have made presentations to the committee. These issues are: (1) How can we identify, locate and characterize the hydraulically important fractures? (2) How do fluid flow and chemical transport occur in the fracture system? (3) How can changes to the fracture system be predicted and controlled?

The committee comprises the following individuals:

Jane C.S. Long, CHAIRMAN  
Lawrence Berkeley Laboratory

Kenneth G. Nolte  
Dowell Schlumberger

Attila Aydin  
Purdue University

Denis L. Norton  
University of Arizona, Tucson

Stephen R. Brown  
Sandia National Laboratories

Olle L. Olsson  
Conterra

Herbert H. Einstein  
Massachusetts Institute of Technology

Frederick L. Paillet  
U.S. Geological Survey

Kevin Hestir  
Utah State University

J. Leslie Smith  
University of British Columbia

Paul A. Hsieh  
U.S. Geological Survey

Leon Thomsen  
Amoco Production Company

Larry R. Myer  
Lawrence Berkeley Laboratory

**The Committee for the Symposium on  
Practical Lessons from the Loma Prieta Earthquake**

**The Committee for the Symposium on Practical Lessons from the Loma Prieta Earthquake** is joint between the Geotechnical Board and the Board on Natural Disasters. The committee's report will be based on a symposium on the subject that was held in San Francisco, California, on March 22-23, 1993, in cooperation with the Earthquake Engineering Research Institute. The symposium focused on significant lessons learned from research conducted on the 1989 Loma Prieta earthquake. The purpose of the symposium and the subject report is to encourage the application of lessons to reduce risk during future earthquakes in vulnerable communities throughout the United States. The report is scheduled for publication in the fall of 1993. The committee that planned and organized the symposium and that is preparing the report comprises the following individuals:

Lloyd S. Cluff, CHAIRMAN  
Pacific Gas & Electric Company

Clarence R. Allen  
California Institute of Technology

Thomas R. Beckham  
South Carolina Emergency Preparedness  
Division

Ian G. Buckle  
State University of New York at Buffalo

Wilfred D. Iwan  
California Institute of Technology

Shirley Mattingly  
Emergency Management, City of Los  
Angeles

Robin K. McGuire  
Risk Engineering, Inc.

Chris D. Poland  
H.J. Degenkolb Associates

Dennis E. Wenger  
Texas A&M University

T. Leslie Youd  
Brigham Young University

**Committee on Advanced Drilling Technologies**

The Geotechnical Board and the Board on Earth Sciences and Resources have been asked by the Geothermal Division of the Department of Energy to evaluate the technical and scientific feasibility of advanced drilling and related technologies. **The Committee on Advanced Drilling Technologies**, consisting of 11 members, will examine concepts for new mechanical and non-mechanical drilling applications including advances in knowledge of the tool-rock interaction, will identify potential opportunities for research, and will make recommendations in a report on the scope and direction needed to realize these opportunities for improved methods for drilling rock. The report will be released in February 1994. The committee comprises the following individuals:

Ali S. Argon, CHAIRMAN  
Massachusetts Institute of Technology

James E. Monsees  
PB/MK Team

Neville G.W. Cook  
University of California, Berkeley

D. Stephen Pye  
UNOCOL Corporation

George A. Cooper  
University of California, Berkeley

Jean-Claude Roegiers  
University of Oklahoma

Michael M. Herron  
Schlumberger-Doll Research

Eugene D. Shchukin  
The Johns Hopkins University

Stephen E. Laubach  
Bureau of Economic Geology

Mark D. Zoback  
Stanford University

William C. Maurer  
Maurer Engineering Inc.

## Committee for an Infrastructure Technology Research Agenda

The Committee for An Infrastructure Technology Research Agenda, conducted jointly with the Building Research Board, has been asked to advise the National Science Foundation's Division of Mechanical and Structural Systems on research needs and priorities in the technology of physical infrastructure, with particular reference to structures, geomechanics, and building systems. The committee's deliberations and subsequent report are anticipated to review (1) the definition of physical infrastructure as a unified concept, cross-cutting technologies that make the concept meaningful, and the distribution of responsibility for infrastructure technology, performance, and management; (2) the significance of physical infrastructure technology to security and quality of life in the domestic and global economy; (3) the status of modern infrastructure technology, in historic perspective, problems of current technology, and progress on new technology; and (4) a critical review of laboratories, manpower, education programs, and other resources for basic infrastructure technology research. Based on this review, the committee will recommend an agenda of high-priority opportunities for the NSF and the research community to guide basic infrastructure core research. The report is expected in December 1993. The committee comprises the following individuals:

James P. Gould, CHAIRMAN  
Mueser Rutledge Consulting Engineers

Thomas D. O'Rourke  
Cornell University

Edward Cohen  
Ammann and Whitney, Consulting  
Engineers

Joseph Perkowski  
Bechtel National Inc.

Thomas J. Eggum  
City of St. Paul, Minnesota

John Ramage  
CH2M Hill, Inc.

Ezra D. Ehrenkrantz  
Ehrenkrantz, Eckstut and Whitelaw

Sarah Slaughter  
Lehigh University

Carl Monismith  
University of California Berkeley

Joel Tarr  
Carnegie Mellon University

Robert S. O'Neil  
Parsons Transportation Group

## **U.S. National Committee on Tunneling Technology**

**The U.S. National Committee on Tunneling Technology (USNC/TT)** serves as the national organization for stimulating advancement in tunneling technology and in the effective use of the subsurface by promoting the coordination of activities such as assessment, research, development, education, training, and collection and dissemination of information. The committee represents the United States in the International Tunnelling Association and works with the American Underground Space Association and others to encourage effective participation in the ITA. Current 1993 membership comprises the following individuals:

Raymond L. Sterling, CHAIRMAN  
University of Minnesota

John W. Hutchinson  
Harvard University

Richard W. Balcerzak  
Metropolitan Water District of  
Southern California

Martin N. Kelley  
Kiewit Engineering Company (retired)

Lloyd A. Duscha  
Consulting Engineer

Albert A. Mathews  
Al Mathews Corporation

George A. Fox  
Grow Tunneling Corporation

Priscilla P. Nelson  
University of Texas at Austin

Richard F. Harig  
Parsons Brinckerhoff Quade and Douglas

Harvey W. Parker, III  
Shannon & Wilson, Inc.



National Research Council  
Geotechnical Board

U.S. National Committee on Tunneling Technology  
Special Session  
July 28, 1992

Daniel Room  
Holiday Inn  
IH-35 East & Wintergreen Road  
DeSoto, Texas  
(214) 224-9100  
Fax (214) 228-8238

AGENDA

Tuesday, July 28th

- 8:30 a.m. Welcome  
— *Lloyd Duscha, Chairman, Pro Tem*  
— *Peter Smeallie, Director, USNC/TT*
- 8:40 Update on Task Items  
— *Peter Smeallie*
- 9:00 The Underground Construction Safety Symposium for the SSC  
— *Priscilla Nelson*
- 9:30 Report on ITA Congress and Developments  
— *Harvey Parker, ITA Representative*  
— *Winfield Salter, ITA Animateur*
- 10:00 Report from the American Underground Space Association  
and other Societies, as appropriate  
— *Susan Nelson*  
— *Charles Daugherty*  
— *Thomas Iseley*
- 10:30 Report from and discussion of the USNC Subcommittee on  
Procurement of Tunnel Design and Construction  
— *Martin Kelly*  
— *Lloyd Duscha*  
— *Richard Harig*
- 11:30 Other Business, Next Meeting
- 11:45 Adjourn

National Research Council  
Geotechnical Board

U.S. National Committee on Tunneling Technology  
Symposium on Underground Construction Safety  
for the Superconducting Super Collider (SSC)

July 28-30, 1992  
Hill Room  
Holiday Inn  
IH-35 East & Wintergreen Road  
DeSoto, Texas  
(214) 224-9100  
Fax (214) 228-8238

AGENDA

**Tuesday, July 28th**

1:00 p.m. Superconducting Super Collider Site Visit. Assemble in Lobby of Holiday Inn for Transportation to the SSC Site.

**Wednesday, July 29th**

8:30 a.m. **SESSION I-INTRODUCTION TO THE PROJECT**

Opening Remarks

- *Peter Smeallie, Director, USNC/TT, National Academy of Sciences*
- *James Carney, Principal Engineer, OSSC/WSO, DOE*

8:45 Welcome

- *Edward G. Cumesty, Deputy Project Director, SSC, Office of Energy Research, DOE*

**SSC Organizational Structure**

9:00 Department of Energy

- *Edward G. Cumesty, Deputy Project Director, SSC, Office of Energy Research, DOE*

9:20 University Research Associates, Inc. (URA)

- *Jon Ives, URA*

9:45 Texas National Research Laboratory Commission (TNRLC)

- *Edward Bingler, TNRLC*

10:00 Break

- 10:10 Parsons Brinkerhoff-Morrison Knudsen (PB/MK)  
— *Richard Curl, PB/MK*
- 10:30 Questions
- 10:50 Introduction to the Keynote Address  
— *Reuben Samuels, Member, Geotechnical Board, NAS*
- 11:10 Keynote Address: "Underground Construction Safety"  
— *Norman Nadel, Chairman, Nadel Associates, Inc.*
- 11:45 Lunch
- 1:00 p.m. **SESSION II-INVITED PRESENTATIONS ON UNDERGROUND SAFETY MANAGEMENT**
- U.S. Bureau of Mines  
— *James Peay, Pittsburgh Research Center*
- 1:45 U.S. Army Corps of Engineers  
— *Donald A. Pittenger, Safety and Occupational Health Office*
- 2:30 Contractor's Viewpoint  
— *Lance de Stwolinski, Kiewit Construction Company*
- 3:15 Break
- 3:30 Milwaukee Tunnel Project  
— *John Ramage, Vice President, CH2M Hill*
- 4:15 English Channel Tunnel Project  
— *Keith Wilkinson, Group Director of Health and Safety, Transmanche-Link*
- 5:00 Adjourn
- 7:30 Informal Discussion/No-Host Bar in the Treese Room

**Thursday, July 30th**

- 8:30 a.m. **SESSION III-REGULATORY ISSUES AND WRAP-UP INSURANCE**
- Introduction to the Day  
— *Priscilla Nelson, Member, USNC/TT*
- 8:40 Increasing Regulatory Impact on Underground Construction  
— *Byron M. Ishkanian, Senior Safety Engineer, State of California*

- 9:30      **Wrap-Up Insurance Options**  
          — *Earl Adams, Jr., Vice President, Johnson and Higgins*
- 10:15      **Break**
- 10:30      **Wrap-Up Insurance at the Washington Metropolitan Area Transit Authority (WMATA)**  
          — *Walter Mergelsberg, Director of Construction, WMATA*
- 11:15      **Pros and Cons of Wrap-Up from a Contractor's Standpoint**  
          — *Larry Parberry, SAE Civil*
- 12:00      **Lunch**
- 1:15 p.m.   **Construction Status**  
          — *Gene Dretke, DOE*
- SSC Safety Programs**
- 1:30      **SSC Laboratory (SSCL)**  
          — *R. Benjamin Rietze, SSCL*
- 2:00      **Conventional Construction**  
          — *Roy Prince, SSCL*
- 2:30      **Break**
- 2:45      **AE/CM Organization and Safety Programs**  
          — *Richard Curl, PB/MK*
- 3:45      **Wrap-Up/Wrap-Around Insurance**  
          — *Larry Babin, SSCL*
- 4:15      **Open Session for Questions and Discussion**
- 5:00      **Adjourn**

National Research Council  
Geotechnical Board

Meeting of the  
U.S. National Committee on Tunneling Technology

Solomon Room  
Hyatt Regency Cambridge  
575 Memorial Drive  
Cambridge, Massachusetts 02139  
(617) 492-1234  
Fax (617) 491-6906

October 4, 1992

**AGENDA**

8:00 a.m.     ***Executive Session of the USNC/TT***

**Discussion of Bias**

— *Peter Smeallie*

National Academy of Sciences/National Research Council committees consist of volunteers, such as yourselves, that are formed to achieve intellectual balance and capabilities. In order to assure this balance, each committee is required to discuss bias and composition, usually once a year. During this discussion you will be asked to describe your current job responsibilities, consultancies you hold, sources of research support, relevant financial holdings, and public positions taken relevant to the committee's charge (such as in published papers). A confidential record will be made of the discussion.

8:30           **Welcome, Introductions, Review of Agenda**

— *Raymond Sterling, Chairman, USNC/TT*

— *Peter Smeallie, Director, USNC/TT*

**Reports**

Attachment A

8:40           Report on July 28, 1992, Special Session of USNC/TT  
— *Lloyd Dusha, Chairman, Pro Tem of Special Session*

8:50           Report on the Underground Construction Safety Symposium for the SSC  
— *Priscilla Nelson*

9:10           Report on the North American Tunneling Conference '92 and AUA  
— *Susan Nelson*

**USNC/TT Meeting Agenda**  
**October 4, 1992**  
**Page two**

- 9:20 a.m. Report on the USNC/TT Sponsored Lecture  
— *Peter Smeallie*
- 9:30 Report on Geological Society of America  
— *Charles Baskerville*
- 9:40 Report on North American Society of Trenchless Technology  
— *Thomas Iseley*
- 9:50 Report on UTRC/ASCE  
— *Harvey Parker*
- 10:00 Report on NRC Infrastructure Studies  
— *Raymond Sterling*  
— *Peter Smeallie*

10:10 Break

**ITA**

Attachment B

- 10:25 Report from the ITA U.S. Representative  
— *Harvey Parker*
- 10:35 Report from the Executive Council  
— *Richard Robbins*
- 10:45 Report from ITA Working Group Representatives  
— *(As appropriate)*

**Issues**

Attachment C

- 11:00 Subcommittee on Procurement of Tunnel Design and Construction  
— *Martin Kelley*
- 11:45 Initiatives with DOE on the Proposed High-Level Nuclear Waste Repository at Yucca Mountain, Nevada  
— *Harvey Parker*  
— *Peter Smeallie*

**USNC/TT Meeting Agenda**  
**October 4, 1992**  
**Page three**

12:00 noon    Lunch

Report on the Geotechnical Board  
— *François Heuze, Member, Geotechnical Board*  
— *Peter Smeallie, Director, Geotechnical Board*

1:00 p.m.    Developments in Mechanics and the Relationship to Tunneling  
— *John Hutchinson*

1:15        Discussion of Potential Technical Issues for Committee Study  
— *Raymond Sterling*

**Committee Composition**

Attachment D

2:00        Discussion of Current Composition of Committee  
— *All*

Suggested Nominees  
— *All*

**Other Business**

Attachment E

2:45        Update on Task Items  
— *Raymond Sterling*

2:55        Next Meeting  
— *Peter Smeallie*

3:00        Adjourn

***Special Presentation***

Proposed "National Program for Advanced Drilling and Excavation Technologies"  
— *Prof. Carl Peterson, MIT*

Meeting of the  
U.S. National Committee on Tunneling Technology  
Geotechnical Board

Sunday, June 13, 1993  
Courier Room, 7th Floor  
Westin Hotel Copley Place  
Boston, Massachusetts

**Agenda**

Sunday, June 13, 1993

8:00 a.m.     Introductions of New Member

              — *George Fox*

              Statement of the Chairman

              — *Ray Sterling*

              Report of the Director

              — *Peter Smeallie*

              The New Division of Infrastructure, Energy, and  
              Environmental Engineering

              — *Dev Mani*

8:30            Prospective Studies

Attachment B

- Microtunneling and Trenchless Technologies

              — *Ray Sterling*

              — *Tom Iseley*

- U.S. Global Competitiveness in Underground Construction:  
Encouraging Technological Innovation

              — *Martin Kelley*

              — *Harvey Parker*

10:10          Symposium on Underground Construction Safety for the  
Exploratory Studies Facility at the Yucca Mountain Project

              — *Ray Sterling*

              — *Priscilla Nelson*

              — *Ken Elder, Yucca Mountain Project Office*

11:00          Follow-on to the July 1992 Symposium on Underground  
Construction Safety for the Superconducting Super Collider

              — *Peter Smeallie*

11:15          International Tunnelling Association

- Report from the ITA Executive Council

              — *Richard Robbins, Vice President, ITA*

- Report from 1993 ITA Annual Meeting in Amsterdam

              — *Harvey Parker*

- USNC/TT Host of the September 1993 ITA Executive  
Council Meeting

              — *Harvey Parker*

              — *Peter Smeallie*



International Tunnelling Association, Continued

- ITA Initiatives with the United Nations
  - *Harvey Parker*
- Reports from ITA Working Groups
  - *Bruce Beverly*
  - *Randy Essex*
  - *John Reilly*
  - *Dennis Lachel*
  - *Others As Appropriate*

12:30 p.m. Lunch in the Flying Cloud Room with the Board of Directors of the American Underground-Space Association. Subject of discussion is the selection of the USNC/TT and AUA to host the 1996 International Tunnelling Association Annual Meeting in conjunction with NAT '96 in Washington, D.C.

- 1:30 Reports from Liaison Representatives
- American Society of Civil Engineers
    - *Harvey Parker*
  - American Underground-Space Association
    - *Susan Nelson*
  - Association of Engineering Geologists
    - *Charles Daugherty*
  - Geological Society of America
    - *Charles Baskerville*
  - Institute of Shaft Drilling
    - *Priscilla Nelson*
  - North American Society for Trenchless Technology
    - *Tom Iseley*
  - Others as Appropriate

Next Meeting

2:00 **EXECUTIVE SESSION — COMMITTEE MEMBERS ONLY**

- Update of Bias Discussion
  - *George Fox*
  - *Richard Harig*
- Committee Composition
- New Committee Business
- USNC/TT Sponsored Lecture at AUA NAT '94
  - *Ray Sterling*

3:00 Adjourn

## Activities of the International Tunnelling Association

Peter Smeallie

The International Tunnelling Association held its 19th Annual Meeting in Amsterdam from April 18-22, 1993 in conjunction with the international congress on "Options for Tunnelling," which was organized by the Netherlands Tunnelling Association, KIVI. Thirty of the forty member nations were represented. The U.S. continued its strong presence; Dr. Harvey Parker led the U.S. delegation which included representatives to each of ITA's working groups.

### U.S. Selected

The highlight of the meeting for the U.S. was the selection of the United States as the host nation for the 22nd ITA Annual Meeting to be held in Washington, D.C. in April 1996. Dr Parker extended the invitation on behalf of the U.S. National Committee on Tunneling Technology and the American Underground-Space Association. The ITA Annual Meeting will be held in conjunction with the North American Tunneling '96, "Tunneling, Underground Space, and Sustainable Development." In his address to the ITA General Assembly in Amsterdam, Dr. Parker stressed the 1996 conference would emphasize the planning and design needs of developing countries as they contemplate the greater use of underground space.

The 1994 ITA Annual Meeting will take place in Cairo, Egypt, from April 3-7, 1994, in conjunction with the conference on "Tunneling and Ground Conditions." The 1995 meeting will be held in Stuttgart, Germany, from May 6-11, 1995, in conjunction with the conference celebrating the 35th anniversary of STUVA.

### Special Report on Immersed Tunnels

A special issue of the ITA's journal, **Tunnelling and Underground Space Technology**, dealing with immersed and floating tunnels was released at the ITA Amsterdam meeting by vice-animateur Ahmet Gursoy. The 300-page report examines the state of the art on immersed tunnels, with an emphasis on steel and concrete tunnels, as well as potential design configurations for floating tunnels. Particularly useful for organizations considering this tunneling option are the 92 cases given in convenient one-page chart forms. Charts include information on tunnel type and use, unusual features, fabrication methods and other helpful features in an abbreviated, but highly useful format. Copies of the report, **Immersed and Floating Tunnels Working Group: State-of-the-Art Report**, can be purchased for \$15.00 from TUST, Underground Space Center, University of Minnesota, 500 Pillsbury Drive, S.E., Minneapolis, Minnesota, 55455.

## ITA and the United Nations

The ITA is moving considerably closer in its cooperation with the United Nations, particularly with planning a joint workshop to be held in Cairo in 1994 on the engineering and financial aspects of a tunnel as the proposed link between Europe and Africa through the Straights of Gibraltar. Also, a cooperative short course, "Technology Transfer," is being developed on the fundamental aspects of the design of underground structures. Plans are well under way to have the ITA Executive Council meeting with U.S. officials in New York City as part of the September 1993 Executive Council meeting, hosted by the U.S. National Committee on Tunneling Technology.

## Working Group Reports

The ten working groups of ITA represent the heart and substance of the organization. During the annual meeting each working group--consisting of up to 20 individuals from as many countries--sets aside time to meet and report on activities undertaken throughout the year.

Birger Schmidt of Parsons Brinkerhoff attended the working group on research which is currently working on three studies: 1) subsidence in urban areas induced by tunneling, 2) noise and vibration in tunnels during operation, and 3) investigation of geological accidents.

The working group on contractual sharing of risk, chaired by Win Salter of Parsons Brinkerhoff Quade & Douglas reported that ITA member nations have been polled on the acceptance of 25 risk-sharing propositions that the group has authored over the past few years. In addition, a new topic has been added to the group's assignment: "Management of Construction."

The working group on subsurface planning, led by Michael Barker, launched a major study on planning to meet fire and life safety requirements for underground facilities.

Dennis Lachel of Lachel Piepenburg & Associates attended the meeting of the working group on health and safety which is focussing its attention on how to collect statistics on accidents. Each country represented on the working group is asked to identify a major project under construction and to identify the major cause or causes of accidents. The group will produce a synthesis report on the subject.

Joe Guertin of GZA Geoenvironmental Inc. reported that the working group on maintenance and repair of underground structures expects to publish during 1993 a summary report of non-destructive methods for systematic inspection of tunnel linings. A report on leak-sealing methods will be published in 1994.

The working group on the design of underground waste repositories, attended by the author, continues work on its report on engineering design considerations for non-nuclear underground waste repositories. It will cover the different safety barriers, the design and use of risk assessment methods for underground facilities such as caverns in rock or rock salt and abandoned mines.

The working group on shotcrete, reports Harvey Parker of Shannon and Wilson, has distributed its compilation of existing guidelines and recommendations for shotcrete use in tunnels. The group is beginning work on the health and safety aspects of shotcreting underground.

John Reilly of John Reilly Associates indicated that the working group on direct and indirect advantages of underground structures is continuing with two thrusts: 1) collection and analysis of advantages related to subsurface parking facilities, and 2) collection of basic data and case studies that help to quantify and illuminate advantages and disadvantages of locating underground.

Priscilla Nelson of the University of Texas attended the meeting of the working group on mechanized tunneling. The first task of the group is to collect project records on tunnel boring machines from member nations in order to define and clarify technical issues regarding TBM applications.

END

## Underground Construction Safety

Between July 27 and 29, 1992, a special symposium was held outside of Dallas, Texas, at the site of the Superconducting Super Collider (SSC) project. The title of the symposium was "Safety Management and Wrap-up Insurance Issues for Underground Construction." The symposium was organized by the U. S. National Committee on Tunneling Technology (USNC/TT) at the request of the U. S. Department of Energy (DOE, Office of Energy Research). Speakers from public and private sectors were invited by the USNC/TT, and DOE invited other participants primarily from the SSC project and federal agencies.

The symposium began with introductory remarks by DOE, the Texas National Research Laboratory Commission (TNRLC, the agency charged with administering participation by the State of Texas in the SSC project), and the SSC Laboratory. Edited transcripts of comments made by invited speakers are obtainable in the public domain through DOE offices at the SSC project. A summary of key points raised in the discussions is given below.

The keynote address was given by Normal Nadel, NAE member, former Chairman of USNC/TT, and Subcommittee Chairman for the study which led to the National Research Council publication "Contracting Practices for the Underground Construction of the Superconducting Super Collider". Nadel reviewed safety-related statistics released by the National Safety Council (NSC). Between 1981 and 1990, death rates in construction were reduced 21 percent, but lost work days remained stable. In 1990, there were 6.4 million workers, 2100 work-related deaths, and 210,000 disabling injuries. The NSC estimates each disabling injury to have a cost of about \$23,000, and each fatality to have an associated cost of \$730,000. These statistics imply that construction-related injuries cost the U.S. about \$6.4 billion in 1990, or about \$1,000 per worker. Safety must be managed, both from concern for worker health and from concern for real project costs. Nadel made some points particularly about safety regulation:

- Past work experience clearly indicates that regulations and cooperative safety management programs are required, and both workers and contractors should be actively involved in these programs.

- Occupational and Safety and Health Administration (OSHA) regulations often address non-problems and suffer from internal inconsistency. Adversarial attitudes in regulation implementation are counterproductive, and qualified inspectors are needed who understand construction. Inspectors do not always need to find violations to do their job.
- The effects of regulations has already resulted in most contractors instituting training programs and supplying safety equipment. However, the object of the regulations is now the contractor and not the worker. Nadel believes we need a system where workers are held responsible for their malfeasance, and where "accident-prone" workers can be terminated from jobs with appropriate documentation.

### Safety Management

James Peay (U. S. Bureau of Mines) summarized experience from USBM research on safety management. Peay noted that, while increased mechanization has resulted in increased production rates and decreased injuries per production volumes, increased mechanization has not insured reduction in lost time injuries. Injury rates in the coal mining industry vary widely across all producers, a variation which can be directly related to management practices. However, safe mines do correlate with high production which is achieved by high commitment organizations which have the following characteristics:

- Employees participate in decision making and problem solving.
- Performance and safety incentive systems are in place - open systems with criteria and awards known in the public domain and with the rewards paid out quickly.
- The management demonstrates a commitment to safety, goes underground often, and avoids status symbols to make miner-management distinctions invisible.
- The organizational structure is flat, with few levels of management and supervision. Greater control and responsibility is given to the individual, and decision making is decentralized.

Don Pittinger (U.S. Army Corps of Engineers, USACE) discussed the long involvement of the Corps in safety management issues. In 1941, the first USACE Construction Safety Manual was produced, and in 1967 a tunneling section was added. This manual is the basis for the Corps program, and it is a contractual document that can be enforced easily. Contractors are paid to follow it. OSHA does not visit Corps sites. USACE believes that accident prevention programs should have definite economic value. Accident rates on Corps jobs are about 25% of the industry average so that, if accident rates on Corps' projects were the same as for the construction industry

as a whole, then the total cost of the project would be 1.0 to 1.5 percent more. Additional comments from Corps experience include:

- Safety programs should be integrated with, rather than superimposed upon, operations.
- A safe job is not one without risks. Rather, safety is doing each task right the first and every time. An acceptable level of risk must be established.
- On Corps jobs, employees are considered to have responsibilities for their own safety and the safety of their co-workers, for attending training sessions, for identifying hazards.
- Worksite surveys and accident analysis by the contractor are important. Corps people have quality assurance responsibilities.
- To err is human - the answer is design. Accidents occur, and the best defense is good design of any procedure, facility, or piece of equipment. If design assures good constructability, safety is enhanced.

Lance de Stwolinski (Kiewit Construction Co.) discussed safety management from a contractor's perspective. For successful contractors, a commitment to safety is made up front, and an organized safety program includes indoctrination (including safety handbooks in the language of the work force), training, and awards. The program must involve all levels within the organization from the very top down. The responsibility for safety should stand with the line managers, safety supervisors, and the construction managers. The project manager has the ultimate responsibility for safety on the project.

- Contractors with good safety records secure the confidence of employees, and one of the major assets of a contractor is the quality of people.
- It is important to establish a system for early detection of unsafe practices. Pre-start up planning and hazard analysis are keys. Accident analysis is important.
- Kiewit jobs are controlled with a "zero tolerance program" which means that each employee is responsible for working safe. If a worker violates safety rules, the first time they receive a written reprimand. For a second violation, the penalty is a week off with no pay. The third time means termination. Drug testing is increasingly common. Kiewit tests prior to hiring. For accidents where drug or alcohol involvement is suspected, workers will be retested for cause.
- Recently, there has been a trend of owners or engineers taking away a lot of schedule float. Contractors are forced into working multiple shifts, 6 or 7 days a week, and with such overwork safety is compromised.

John Ramage (Vice President, CH2M Hill ) spoke about experiences on the Milwaukee Water Pollution and Abatement Program, to be completed in late 1995 at a cost of \$ 2.29 billion (close to

the 1982 estimate of \$ 2.1 billion). CH2M Hill is the resident engineer/construction manager on this program. CH2M Hill has full-time safety coordinators and is responsible for staff training and verifying that contractors have met contractual requirement for specific safety procedures.

Ramage focused many of his comments in the aftermath of a November 1988 methane explosion which killed the three most experienced people on one underground construction contract. The contractor was convicted of negligent homicide. A federal grand jury was convened, but the jury chose not to hand down an indictment against the engineer for criminal violations of OSHA. The accident occurred in spite of the CH2M Hill commitment to develop a whole concept of safety from a management point of view, from a control point of view, from a redundancy point of view, and from an equipment and training point of view. Ramage is convinced that the only way to further improve on safety is to technically pre-qualify contractors. Top down commitment concerning safety, as indicated by a contractor's experience record, has to be the absolute single most important factor in pre-qualification.

The extensive discussion of safety for gassy ground operations cannot be detailed here, but routine defense strategies can be defined. In addition to training, the first defense for construction in gassy ground is a ventilation system of sufficient capacity to keep concentrations well below the lower explosive limit. The second order of defense is redundant detection systems, and the third order of defense is evacuation. The final line of defense is an upgrade (per National Electric Code, NEC) of equipment. Additional points raised by Ramage included:

- The OSHA code is ambiguous, and major code changes are needed in order for all parties to the construction process to truly understand unequivocally what are the responsibilities and what procedures should be taken to provide a safe working operation.
- For projects in gassy ground, application of the restrictive OSHA code makes underground work in hazardous conditions difficult if not impossible. The NEC recognizes that there are some conditions where you must have the authority to work in a hazardous environment. The relevant parts of the NEC should apply in underground construction.

Byron Ishkanian, Safety Engineer for the Division of Occupational Safety and Health (DOSH), State of California supported many of Ramage's observations. California operates under the 1972 Tom Carrell Tunnel and Mine Safety Act and the Tunnel Safety Orders, which are anticipatory



regulations. Under State law, every horizontal or vertical excavation 30 in. in diameter and larger is classed as a tunnel or shaft. The State reviews plans and borings for projects, visits the site, and makes classifications according to whether the excavation is to be considered Non-Gassy, Potentially Gassy, Gassy, or Extrahazardous. For each classification, different procedures are required by the contractor.

Engineers for the State analyze excavation equipment and ask for sensors to be installed at specific locations to monitor air flow. For Gassy or Extrahazardous classifications, the State requires contractors to use exhaust ventilation. If there is a chance of hitting gasoline-contaminated ground, the contractor is recommended to put their main crew through a 40-hour training program so that they will be prepared and work can continue safely without shutdown.

Pre-bid and pre-job conferences are required, including the fire department, personnel, labor unions, owners, subcontractors, consultants - all who are involved in a project. An emergency plan is developed for each specific project. The contractor must have his own rescue team which responds first because they know where to get into the tunnel, the Sheriff's Rescue team responds second, and the Fire Department team stands ready to respond as a third line of defense.

#### Wrap-up Insurance Issues

Several of the speakers on safety management indicated the importance of a viable incentive program. Incentives keyed to safety programs and wrap-up insurance are very effective, and the incentives should include the workers, as they are most able to effect the desired results.

Earl Adams, Jr. (Vice President, Johnson and Higgins) offered comments from his experience with wrap-up insurance policies (or CIPs - coordinated insurance policies). A wrap-up program is an owner-provided insurance program. The owner secures and pays for those coverages that a contractor normally would purchase on its behalf: general liability, worker's compensation, and property insurance. Wrap-up covers the owner and most contractors, usually with the same limit. Losses are paid and costs are controlled through effective claims management and administration that is supported by safety and loss control measures that help avoid injuries to workers and the public and damage to property. Contractors are required to deduct insurance costs from bids.

Wrap-up programs are designed to insure large projects with construction values of \$100 million or more. The primary incentive for a wrap-up is to decrease the owner's vulnerability and to save money. The best way to save money is to cut losses, which brings attention back to safety. With losses controlled, the savings generated frequently allow the underwriter to return a portion of the premiums in the form of dividends.

The advantages of wrap-up include owner control of the program, enhancement of public relations, adequate limits provided to all parties, broad coverage terms dictated by the particular project hazards, a coordinated safety program, and cost savings which are the result of volume discounts, good loss experience, and elimination of contractor mark-ups. One additional advantage is that, by relieving all contractors of most insurance requirements, a wrap-up increases the number of small and disadvantaged business enterprises that can participate.

There can also be a disincentive to safety. Under some wrap-up packages, the business incentive for a contractor to spend money on a safety program beyond the legal requirements is removed if savings go only to the owner. Contractors (and subcontractors) need to be beneficiaries of any reward for good loss experience. It is important to require contractors to contribute to claim payments via a deductible.

Experience modification rates (EMRs) compare a contractor's experience with the industry average. For the construction industry, the average EMR reflects the industry's overall loss experience and currently is about 1.07, meaning that for every dollar collected in premiums, underwriters pay out about \$1.07 in claims. The EMRs used by underwriters have a significant effect on premiums, so that an experienced contractor with a better safety record will be more competitive in bidding a job. However, new companies (including new joint ventures), which have not yet established their own experience modification rates, may pay premiums based on standard rates even if the loss history of the joint venture individual entities reflects horrible losses. Underwriters are starting to modify their practices with regard to assigning EMRs to more closely reflect the loss experience of the entities forming the joint venture.

Larry Parberry (Vice President, SAE Civil Construction, Inc.) acknowledged the prevalent view of contractors in that they do not always trust wrap-up insurance programs. Safety and construction should be a partnering relationship between the owner and the contractors, subcontractors and suppliers. It may be possible to sell wrap-up to an owner on the basis of saving millions of dollars, but the mutual insurance needs of the contractors cannot be ignored.

In fact, contractors are not adamantly against wrap-up programs. Rather, they are opposed to owners who don't understand that the overall objective of the wrap-up is to have a safe place for all parties involved. In addition, a main issue for contractors is that there has to be a relationship between the owner's broker and the contractor.

It is important to have a wrap-up management director with knowledge of construction and what the overall risks are. If the wrap-up program is really set up to only save money, not necessarily to pay claims, the contractor becomes concerned. Administration is very important - if claims can be prevented on the front end and effectively administered at the back end, not only will the owner's money be saved but it also will improve the contractor's EMR.

Walter Mergelsberg (Director of Construction, Washington Metropolitan Area Transit Authority, WMATA) discussed the WMATA wrap-up insurance and construction safety awareness program (SAP). The safety program, established in 1978, represented a positive action to coordinate all available means of eliminating or controlling hazards and risks associated with Metro system construction. Prior to 1978, WMATA's record was average at best, and it was clear that contractor's were not giving adequate emphasis to safety. Costs associated with construction accidents were rising, and the immediate objective was to reduce worker's compensation claims.

WMATA also provides a monetary incentive tied to a safety performance goal. The contractor earns a payment at the end of the contract if his incidence rate for lost-time accidents is below the target rate specified in the contract. Conversely, higher incidence rates result in a penalty. WMATA awards plaques in public assembly to the resident engineer, contractor safety engineer, and project management jointly on projects which have achieved safety goals. WMATA estimates that its program has resulted in a 55 percent injury incidence rate decrease, and has saved the

construction program about \$93 million. Contractors have been awarded a total of \$9.0 million for providing an environment with fewer accidents.

Keith Wilkinson, Group Director of Health and Safety, Transmanche-Link (TML), in a delightful presentation, described how safety management on the Channel Tunnel project has progressed through a conversion from a reactive, compliance-led culture to a proactive positive safety management style. With a negative press attitude towards the tunnel, the general public resentment, and the general condition of society seeking retribution, there was a strong motivation for TML management to develop a safe, self-regulated environment for underground construction.

In order to develop a positive safety culture, TML adopted a safety management structure similar to that developed by DuPont. TML's organization is a hierarchical system of management safety committees. Line management must investigate accidents and make decisions. The Health and Safety Group has oversight responsibility and performs management safety audits with a numerical safety audit system. Worker training is acknowledged as essential. There are three days of induction training for every newcomer, and people who misbehave are reinducted with a severe financial penalty in loss of salary and bonuses.

Recent disasters have triggered a review of legislation in many countries. In the various reports by commissions of inquiry into U. K. legislation were a number of recommendations, including the need for self-regulation, and greater employee responsibility and participation. The report from the investigation of the King's Cross fire in the U.K. included the following comment which serves as a fitting conclusion to this article:

A safe environment is not one in which there is an absence of serious injury accidents, but it is the result of active participation by management and staff in identifying hazards and then doing something about them. In other words, the absence of accidents is a negative measure largely dependent on luck, while the identification and then prompt elimination or control of hazards is a positive step and is essential to the discharge of our duties under current legislation.

written by: Dr. Priscilla P. Nelson, Associate Professor in the Department of Civil Engineering at The University of Texas at Austin, and chairperson of the First North American Rock Mechanics Symposium (NARMS) to be held in Austin June 1-3, 1994.

**U.S. National Committee for Rock Mechanics**

**The U.S. National Committee for Rock Mechanics (USNC/RM)** provides advisory studies and reports on problem areas in rock mechanics; provides for U.S. participation in international activities in rock mechanics, principally through adherence to the International Society for Rock Mechanics; and keeps the U.S. rock mechanics community informed about new programs directed toward major areas of national concern in which rock mechanics problems represent critical, or even limiting factors—for example, energy resources, tunneling and other forms of excavation, underground storage and waste disposal, and reactor siting. The USNC/RM sponsors the U.S. Rock Mechanics Symposium and is the U.S. partner in the new North American Rock Mechanics Symposium series. Current 1993 membership comprises the following individuals:

Barry H.G. Brady, CHAIRMAN  
Dowell Schlumberger, Inc.

Ronald P. Nordgren  
Rice University

Bernard Amadei  
University of Colorado, Boulder

Miklos Salamon  
Colorado School of Mines

Herbert Einstein  
Massachusetts Institute of Technology

Lawrence W. Teufel  
Sandia National Laboratories

Bezalel C. Haimson  
University of Wisconsin

Donald L. Turcotte  
Cornell University

Jane C.S. Long  
Lawrence Berkeley Laboratory

Lewis V. Wade  
U.S. Bureau of Mines

James E. Monsees  
PB/MK Team

National Research Council  
Geotechnical Board

Attachment N

Meeting of the  
U.S. NATIONAL COMMITTEE FOR ROCK MECHANICS

Room 250  
The National Academy of Sciences  
2101 Constitution Avenue, N.W.  
Washington, DC 20418  
(202) 334-2250

January 28-29, 1993

AGENDA

Thursday, January 28th

*Executive Session/Committee Members Only*

9:00 am Chairman's Statement  
— Barry Brady, Chairman, USNC/RM

Introduction of New Committee Members  
— Bezalel Haimson  
— Lawrence Teufel  
— Donald Turcotte

Bias Discussion  
— Peter Smeallie

*National Academy of Sciences/National Research Council committees consist of volunteers, such as yourselves, that are formed to achieve intellectual balance and capabilities. In order to assure this balance, each committee is required to discuss bias and composition, usually once a year. During this discussion you will be asked to describe your current job responsibilities, consultancies you hold, sources of research support, organizational affiliations, relevant financial holdings, and public positions taken relevant to the committee's charge (such as in published papers). A discussion of scientific misconduct will also be held. A confidential record will be made of the discussion.*

Other Matters Appropriate for Executive Session

- Ethics in Rock Mechanics  
— Bezalel Haimson
- Discussion of INTRAVAL Project and the Possible Role of the USNC/RM  
— Peter Smeallie

*Session open for guests*

10:30 Special Studies of the USNC/RM

- Committee on Fracture Characterization and Fluid Flow
  - *Jane Long*
  - *Discussion on Chapter 7 may be delayed until H. Einstein arrives at 2:00 pm*
- Report on Stability, Failure, and Measurements of Boreholes and Other Circular Openings
  - *Peter Smeallie*
- Proposed Study on U.S. Funding of Rock Mechanics Research
  - *Lew Wade*
- Proposed Study on Rock Anisotropy
  - *Bernard Amadei*

12:00 noon Lunch in Meeting Room

12:45 pm Policies for Organization of the U.S. Rock Mechanics Symposium

- Section on Financial Guidelines
  - *Lew Wade, Ron Nordgren, Barry Brady*
- Overall Discussion and Disposition

1:30 U.S. Rock Mechanics Symposia

- Final Report on the 33rd Rock Mechanics Symposium in June 1992 in Sante Fe Including Special Symposium Fund
  - *Larry Teufel, Peter Smeallie*
- Status Report on the 34th Rock Mechanics Symposium in June 1993 in Madison, Wisconsin
  - *Bezalel Haimson*
- Discussion on Sites for the 35th (1995) and 36th (1997) Symposia
  - *Barry Brady, Peter Smeallie*

3:00 1993 Rock Mechanics Awards  
— *Miklos Salamon, Bernard Amadei*

3:30 ISRM

- Report from ISRM Council Meeting, September 1992, Chester, England
  - *Barry Brady*

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ISRM, continued

- Agenda Items for the ISRM Council Meeting, June 1993, Lisbon, Portugal
  - *Barry Brady*
- Application to Host 1994 ISRM International Symposium in June in Austin, Texas, as Part of the First North American Rock Mechanics Symposium
  - *Jim Monsees*
- Discussion of Greater U.S. Participation in ISRM Working Commissions
  - *Herbert Einstein*
- Discussion of *News Journal* and U.S. Correspondence
  - *Miklos Salamon, Peter Smeallie*
- ISRM U.S. Membership
  - *Peter Smeallie*

5:30 Adjourn for the Day

5:45 Reception, NAS Executive Dining Room

6:30 Dinner, NAS Executive Dining Room  
— *Remarks by Arch Wood, Executive Director, Commission on Engineering and Technical Systems, National Research Council*

Friday, January 29th

8:30 am Yucca Mountain Site Characterization Project: Issues of Rock Mechanics  
— *Max Blanchard, Deputy Project Manager, YMP, DOE*  
— *Michael Voegele, SAIC*

General Discussion with Committee

10:30 Dynamic Tunnel Closure in Jointed Rock  
— *Paul Senseny, Defense Nuclear Agency*

General Discussion with Committee

12:30 pm Lunch in Meeting Room



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1:00            Related Studies and Activities

- Geotechnical Board/U.S. National Committee on Tunneling Technology  
    — *Peter Smeallie, Priscilla Nelson*
- Symposium on Practical Lessons from the Loma Prieta Earthquake  
    — *Peter Smeallie*
- Advanced Drilling Technology  
    — *Peter Smeallie, Jim Monsees*

1:30            First North American Rock Mechanics Symposium (NARMS) in June 1994 in Austin, Texas

- Background, Trilateral Agreement  
    — *Peter Smeallie*
- Terms of the Agreement and Working Understandings  
    — *Barry Brady*
- First NARMS and Role of the USNC/RM  
    — *Priscilla Nelson*

2:55            Next Meeting

3:00            Adjourn

National Research Council  
Geotechnical Board

Meeting of the  
U.S. National Committee for Rock Mechanics

Wisconsin Center, Room 315  
North Lake and Langdon Streets  
Madison, Wisconsin  
(608) 262-5514

**AGENDA**

**Sunday, June 27th**

***EXECUTIVE SESSION FOR COMMITTEE MEMBERS ONLY***

- 8:00 a.m.    Chairman's Statement  
                    — *Barry Brady*  
                    The New Division of Infrastructure, Environment, and  
                    Energy Engineering  
                    — *Dev Mani*  
                    Director's Report  
                    — *Peter Smeallie*
- 8:30            Committee Composition  
                    — *Peter Smeallie*

***SESSION OPEN FOR GUESTS***

- 9:00            Special Studies of the USNC/RM
- Report on Stability, Failure, and Measurements of  
Boreholes and Other Circular Openings  
— *Jean-Claude Roegiers*
  - Report on Committee on Advanced Drilling Technologies  
— *Neville Cook*
  - Committee on Fracture Characterization and Fluid Flow  
— *Jane Long*
  - Proposed Study on U.S. Rock Mechanics Research for the  
21st Century  
— *Lew Wade*
  - Proposed Study on Rock Anisotropy  
— *Bernard Amadei*
  - Discussion of Potential Policy-Oriented Studies  
— *All*
  - Discussion of Potential Activities with the Yucca Mountain  
Project  
— *All*

- 10:00 U.S. Rock Mechanics Awards Selection Process  
— *Barry Brady and Bernard Amadei*  
How is it working?  
How can it be improved?
- 10:30 a.m. U.S. Symposia on Rock Mechanics/North American Rock Mechanics Symposium
- 1993 34th U.S. Symposium on Rock Mechanics, Madison, Wisconsin  
— *Bezalel Haimson*
  - 1994 First North American Rock Mechanics Symposium, Austin, Texas  
— *Priscilla Nelson*
  - 1995 35th U.S. Symposium on Rock Mechanics, Reno, Nevada  
— *Jaak Daemen*
  - 1996 Second North American Rock Mechanics Symposium, Canada  
— *Peter Kaiser*
  - 1997 36th U.S. Symposium on Rock Mechanics  
— *Scott Huang*
- 12:00 noon Lunch at Husnus, 547 State Street (256-0900)
- 2:00 p.m. General Discussion on Policies and Guidelines for the Rock Mechanics Symposia
- How are they working?
  - How can they be improved, if needed?
- 2:30 International Society for Rock Mechanics
- Report from the President  
— *Charles Fairhurst*
  - Report from the Vice President, North America  
— *Peter Kaiser*
  - Report from U.S. Delegation to the 1993 ISRM Meeting in Lisbon  
— *Barry Brady*  
— *Peter Smeallie*
  - Report from *ISRM News Journal*  
— *Jennifer Bartholomew*
  - Report from Working Commissions  
— *Herbert Einstein, Chairman, Commission on Swelling Rocks*  
— *Barry Brady, Member, Commission on Petroleum Rock Mechanics*  
— *Peter Smeallie, Member (former), Commission on Education*  
— *Others, as Appropriate*
  - Discussion on Increasing the U.S. Involvement in International Rock Mechanics
    - The ITA Example  
— *Peter Smeallie*  
— *Priscilla Nelson*
  - U.S. ISRM Membership  
— *Peter Smeallie*

- 4:00        Intraval Project
- *Charles Fairhurst*
  - *Charles Voss*
  - *Peter Smeallie*
- 4:20        Next Meeting
- 4:25        Other Business
- 4:40        General Discussion: What is happening to geomechanics in the national  
              labs? In the Bureau of Mines?
- *Jane Long, Lawrence Berkeley Laboratory*
  - *Larry Teufel, Sandia National Laboratories*
  - *Lew Wade, U.S. Bureau of Mines*
- 5:15        Adjourn